



*Green
Book*

**GUATEMALAN
COFFEES**



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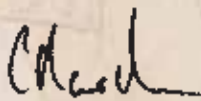
Truly Green

Coffee has helped fuel the economy of Guatemala for over a hundred years. Today, coffee remains one of Guatemala's principal export products, accounting for 40 percent of all revenue generated by agricultural exports. Since 1960, Anacafé, the Guatemalan National Coffee Association, has promoted the highest standards in every aspect of coffee production. As we become increasingly aware of the importance of our natural resources and environment, we feel it is our responsibility to understand how this essential crop interacts with its ecosystem.

In this brief handbook we attempt to tackle several complex issues and present them to the reader in a straightforward manner. Countless books, studies, and experts were consulted in preparing this text in order to obtain a clear understanding of the issues. Our goal is to shed light on the role of shaded coffee and its impact on Guatemala's biodiversity, water, and soils.

Many exciting alternatives for future coffee production are discussed in these pages; alternatives that meet the needs of nature, local communities, and highly productive farming operations. But we also face ongoing challenges, such as how to valorize the environmental services that coffee forests provide and how to address residual products from processing.

Working together—producers, buyers, roasters, and retailers—we are confident that Guatemala will continue to thrive while producing coffees that are truly green.



Christian Rasch
Chairman, Anacafé



Coffee in Guatemala

Fine coffee is cultivated between 4,300 and 6,500 feet above sea level.



Annual rainfall averages in Guatemala range from 32–200 inches.

What makes Guatemalan Coffees so special?

High altitudes

Crisscrossing mountain ranges, including the legendary Sierra Madre, allow coffee to be grown in most regions of Guatemala. The finest is cultivated between 4,300 and 6,500 feet (1,300–2,000 meters) above sea level.

More than 300 microclimates

Major geographic influences, like the Atlantic and Pacific oceans, large crater lakes, flat plains, and high mountain ranges, combine to create more than three hundred microclimates in an area of 67,663 square miles (108,889 square kilometers). These microclimates contribute to the distinct cup profiles of each region's coffee.

Consistent rainfall patterns

Rainfall in Guatemala's coffee regions is not only plentiful, but varied. Annual averages range from 32 to 200 inches (800–5,000 millimeters), falling within a well-defined rainy season. At least one hard, dependable rain during the dry season induces the flowering that turns into coffee eight months later.

Coffee Types by Altitude

Republic of Guatemala

Geographic Coordinates
15 30 N, 90 15 W

Area
Total: 67,663 sq miles
(108,889 sq km)
Land: 67,378 sq miles
(108,430 sq km)
Water: 286 sq miles
(459 sq km)

Borders
Belize
165 miles (266 km)
El Salvador
126 miles (203 km)
Honduras
159 miles (256 km)
Mexico
598 miles (962 km)

Coastline (Atlantic & Pacific)
249 miles (400 km)

Elevation Extremes
Lowest point:
Pacific Ocean
0 feet/meters
Highest point:
Tajumulco volcano
13,845 feet (4,220 meters)

About Guatemalan Coffees
270,000 hectares of coffee planted
Grown in 20 of the country's 22 departments
98% shade grown
98% washed Arabica



	Strictly Hard Bean (SHB) 4,500 feet and above (above 1,370 m)
	Semi Hard - Hard 3,500 - 4,500 feet (1,066 - 1,370 m)
	Prime - Extra Prime 2,500 - 3,500 feet (762 - 1,066 m)

- River
- Lake
- 4-Lane Highway
- Central American Highway
- National Road
- Port
- Town

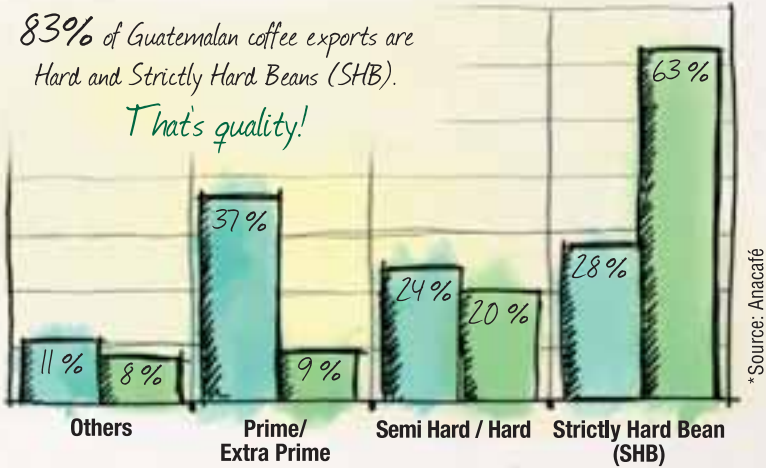
Source: Anacafé
Map data updated 2007

Trend to Quality

Guatemala's coffee has been moving in one direction—**up**. Not just in production numbers but in quality. Today, the country produces 60 percent more coffee than it did thirty years ago. Furthermore, the type of coffee has shifted away from primes to higher quality Hard Bean (HB) and Strictly Hard Bean (SHB).

83% of Guatemalan coffee exports are Hard and Strictly Hard Beans (SHB).

That's quality!



3.72 million 60-kg bags

3.75 million 60-kg bags

■ Crop year **1995/1996**

■ Crop year **2006/2007**

Quality coffees from Guatemala are being discovered through the Cup of Excellence competition and auction. As indicated by the record-breaking prices received from buyers all over the world, Guatemala's quality is not going unnoticed.



As coffee production moves up in altitude, what happens to low-lying farms? Thanks to an innovative program, PINFOR, developed by Guatemala's National Forests Institute (INAB), many of those farms are now being used for forestry projects.

8 Coffee Regions

Virtual coffee picking

Since the early 1990s, Anacafé has led a pioneering effort to define the country's coffee-producing regions based on cup profile, climate, soil, and altitude. As a result of this ambitious project, eight distinct regions producing Strictly Hard Bean (SHB) have been identified in Guatemala.

With the help of GPS technology in 2000, Anacafé established its Geographic Information System (GIS) defining not only regions but individual farms, cooperatives, and small producers. Technicians traveled the country tracking the GPS location, altitude, coffee types, production volumes, and other important attributes of each farm. This extensive process, which continues today, has already mapped more than three thousand five hundred farms and 95 percent of cooperatives. It has also allowed the Antigua region to gather sufficient technical data to solicit a Denomination of Origin for its coffee, with several other regions ready to follow suit.

The next stage in the project is the Coffee Search System, now under development. This innovative tool will allow interested users to search for coffees online according to attributes such as type, variety, growing altitude, region, harvest season, and other factors. Matching results will be displayed in the form of web maps giving buyers a comprehensive tool for finding their ideal coffee.

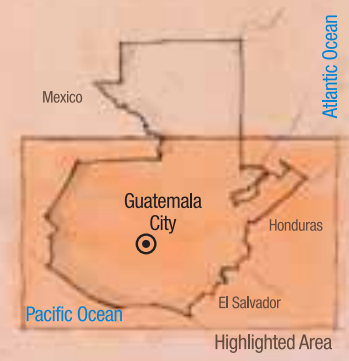


8 Coffee Regions



A great example of transparency

This high-definition photograph taken and shared by the Guatemalan Ministry of Agriculture (MAGA) shows a portion of **Acatenango Valley** with coffee farms geo-positioned. More than just coordinates, each farm's record in Anacafé's GIS also includes key information on climate, crops, production techniques, processing, and other important attributes. Furthermore, several farm owners, working with Anacafé, have gone a step further, mapping multiple points to accurately convey each farm's area. This zoom clearly shows the potential that GIS has to become a source for precise scientific information.



A Rainbow of Choices



Guatemalan Coffees reflect the ways different soils and climate patterns combine with high altitudes to create marked regional differences.

	Acatenango Valley	Antigua Coffee	Traditional Atitlán	Rainforest Cobán	Fraijanes Plateau	Highland Huehue	New Oriente	Volcanic San Marcos	
Altitude	6500 feet / 2000 meters 4300 feet / 1300 meters	5600 feet / 1700 meters 5000 feet / 1500 meters	5600 feet / 1700 meters 5000 feet / 1500 meters	5000 feet / 1500 meters 4300 feet / 1300 meters	6000 feet / 1800 meters 4500 feet / 1400 meters	6500 feet / 2000 meters 5000 feet / 1500 meters	5600 feet / 1700 meters 4300 feet / 1300 meters	6000 feet / 1800 meters 4300 feet / 1300 meters	
Rainfall average low / high	1800 mm / 72" 1200 mm / 48"	1200 mm / 48" 800 mm / 32"	2300 mm / 92" 1800 mm / 72"	4000 mm / 160" 3000 mm / 120"	3000 mm / 120" 1500 mm / 60"	1400 mm / 56" 1200 mm / 48"	2000 mm / 80" 1800 mm / 72"	5000 mm / 200" 4000 mm / 160"	
Temperature average low / high	88° F / 31° C 57° F / 14° C	72° F / 22° C 64° F / 18° C	73° F / 23° C 68° F / 20° C	68° F / 20° C 59° F / 15° C	79° F / 26° C 64° F / 12° C	75° F / 24° C 68° F / 20° C	77° F / 25° C 64° F / 18° C	81° F / 27° C 70° F / 21° C	
Relative Humidity range	70-80%	65% (constant)	75-85%	85-95%	70-90%	70-80%	70-80%	70-80%	
Harvest Season	December mid-March	January mid-March	December-March	December-March	December-February	January-April	December-March	December-March	
	December	January	February	March	April	December	January	February	
	Soil major microclimate influence	Volcanic with pumice Acatenango & Fuego volcanoes	Volcanic with pumice Enclosed valley	Volcanic Large crater lake	Limestone & clay Atlantic Ocean	Volcanic with pumice Highland plain	Limestone Tehuantepec plain	Metamorphic & clay Atlantic Ocean	Volcanic Pacific Ocean
Varieties taller-growing shorter-growing	Bourbon Caturra, Catuai	Bourbon Caturra, Catuai	Bourbon, Typica Caturra, Catuai	Bourbon, Maragogype Catuai, Caturra, Pache	Bourbon Caturra, Catuai, Pache	Bourbon Caturra, Catuai	Bourbon Catuai, Caturra, Pache	Bourbon Caturra, Catuai	
Main Drying Process	Sun	Sun	Sun	Dryer	Sun	Sun & dryer	Sun & dryer	Sun & dryer	
Type of Shade Tree	Gravilea & Inga	Gravilea	Gravilea & Inga	Inga	Inga	Inga	Inga	Inga	

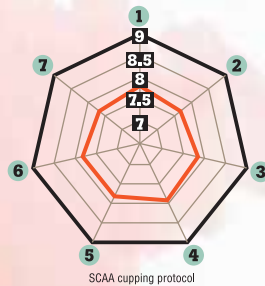
Discover Guatemalan Coffees

Cup Profiles



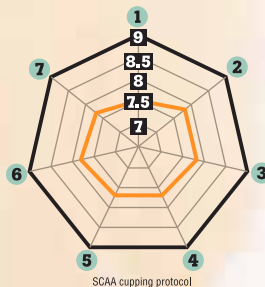
A marked acidity, fragrant aroma, balanced body, and clean lingering finish.

Acatenango Valley is a recently discovered jewel in the world of Guatemalan Coffees. Since the 1880s, farmers have grown coffee under dense shade as high as 6,500 feet (2,000 meters), creating a forest that is an ecological gift. Constant eruptions from the nearby Fuego volcano keep the coarse, sandy soils full of minerals. Temperate gusts from the Pacific Ocean and marked seasons allow coffee to be sun-dried, and processing follows age-old family traditions.



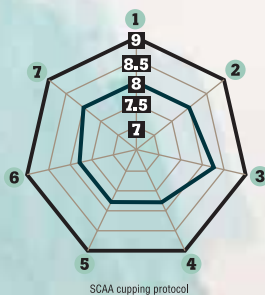
Elegant and well balanced with a rich aroma and very sweet taste.

Rich volcanic soil, low humidity, lots of sun, and cool nights characterize the **Antigua Coffee** region. This valley is surrounded by three volcanoes, Agua, Fuego and Acatenango. Every once in a while, Fuego—one of Guatemala's three active volcanoes—adds a fresh dusting of mineral-rich ash to Antigua's soil. Volcanic pumice in the soil retains moisture, which helps offset Antigua's low rainfall. In Antigua, shade is especially dense to protect the coffee trees from the region's occasional frost.



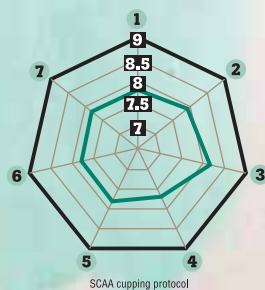
Delightfully aromatic with a bright citrus acidity and full body.

Of Guatemala's five volcanic coffee regions, Atitlán's soil is the richest in organic matter. Ninety percent of **Traditional Atitlán** is cultivated along the slopes of the dramatic volcanoes that dominate the shores of Lake Atitlán. The daily winds (called *Xocomil*) that stir the cold lake water are an important influence on the microclimate. The culture's highly developed artisan tradition is reflected in the small producer's skilled cultivation and processing.



Distinct fresh fruit notes. Fine, well-balanced body and pleasant aroma.

Cobán is cloudy, rainy, and cool all year long. Most **Rainforest Cobán** is cultivated on the area's distinctive rolling hills, under the tropical influences of the Atlantic Basin, in limestone and clay soils. Cobán has two seasons: rainy and rainier. Cobán's celebrated *chipichipi* frequently engulfs the region in a fine mist that falls from the dense cloud cover.



All of Guatemala's high altitude coffees develop a delightful aroma, pleasant acidity, full body, and delicate sweetness, a combination that results in a balanced and flavorful cup. In each of Guatemala's eight regions, these cup attributes create a special complexity producing eight cup profiles.

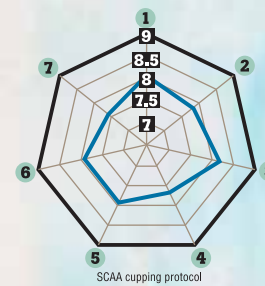
SCAA cupping protocol considers:

- 7 Very good
- 8 Excellent
- 9 Outstanding



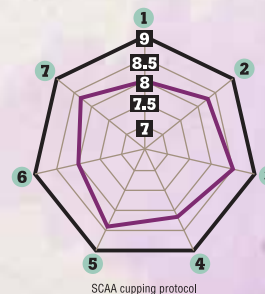
Bright and persistent acidity. Aromatic with a defined body.

Volcanic pumice soil, very high altitudes, plenty of rain, variable humidity, and an active volcano characterize the region. Pacaya, the most active of Guatemala's three erupting volcanoes, supplies the region with a light deposit of ash every so often, giving the soil an important mineral boost. The dry season has lots of sun. Although clouds, fog, and heavy dew are common in the early morning, they burn off quickly allowing all **Fraijanes Plateau** to be sun-dried.



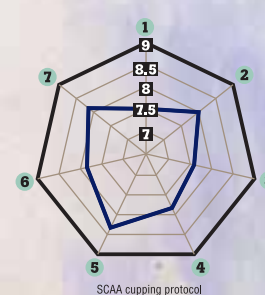
Fine, intense acidity with a full body and pleasant wine notes.

Of the three non-volcanic regions, Huehuetenango is the highest and driest under cultivation. Thanks to the dry, hot winds that blow into the mountains from Mexico's Tehuantepec plain, the region is protected from frost, allowing **Highland Huehue** to be cultivated up to 6,500 feet (2,000 meters). Huehuetenango's extreme remoteness requires that virtually all producers process their own coffee. Fortunately, the region has an almost infinite number of rivers and streams, so a mill can be located almost anywhere.



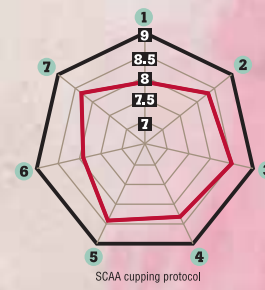
Well balanced and full-bodied with a chocolaty flavor.

Coffee in this region has been cultivated, almost exclusively, by small producers since the 1950s. Today, virtually every farm on the mountain has become a coffee-producing unit and what was once one of Guatemala's poorest and most isolated areas is vibrant and growing. **Oriente** is located on what was once a volcanic range. Its soil is made from metamorphic rock: balanced in minerals and quite different from soils in regions which have seen volcanic activity since coffee was first planted.



Delicate floral notes present in aroma and taste, pronounced acidity, and good body.

The warmest of the eight coffee-growing regions, San Marcos also has the highest rainfall pattern, reaching up to 200 inches (5000 mm). The seasonal rains come earlier than in other regions, producing the earliest flowering. As in all of Guatemala's remote regions, most of **Volcanic San Marcos** is cultivated on farms with their own processing mills. Because of the unpredictability of the rain during the harvest season, much of the coffee is pre-dried in the sun and finished in a *Guardiola* dryer.





Shedding Light on Shade

Standing on one of Guatemala's coffee-covered hillsides, it is not difficult to understand the importance of shade. At these higher elevations the sun's rays radiate peak levels of intense ultraviolet light; tropical downpours soak the earth in a matter of minutes; and driving winds, and occasional frost, envelop mountains. Faced with these erosive elements, coffee plants need protection.

Guatemalan coffee has been grown under a canopy of shade since it was first introduced to the country more than two centuries ago. Today, 98 percent is still shade-grown. As coffee farmers have always known, using shade is a common-sense practice as it provides invaluable protection and nutrition to coffee plants.

How shade works

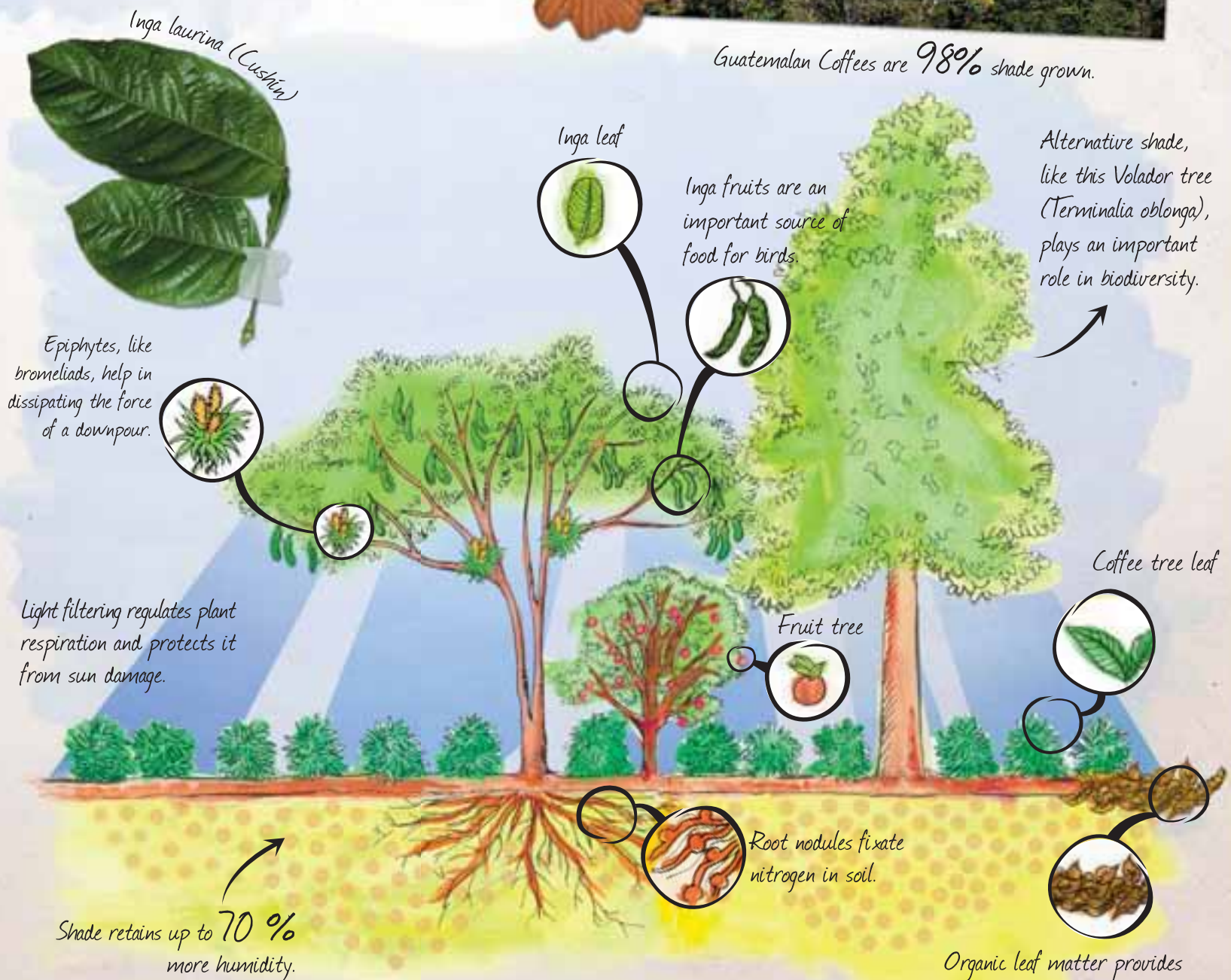
Shade trees work primarily by moderating the intensity and quality of sunlight. Filtering light regulates plant respiration and photosynthesis, and protects coffee roots and leaves from damage. It also allows coffee beans to mature slowly, improving the attributes of body and acidity in the cup.

But it is during the rainy season that shade provides its most valuable service. By intercepting rainfall and slowly releasing it, shade trees prevent erosion and maintain humidity in the soil. Research has shown that as a result shaded farms retain 70 percent more humidity than their full-sun counterparts, providing much needed moisture during dry periods.

More than just protection, shade trees offer nourishment. The most common shade species, Inga (*Inga* spp.), has the unique ability to convert nitrogen gas in the atmosphere into a usable form, through a process called nitrogen fixation. By infusing the soil with nitrogen, these shade trees quickly improve the fertility of the soil and reduce the need for chemical fertilizers. Moreover, their decaying leaves add a layer of organic matter that can reach up to seven tons in one hectare. This deposit provides important nutrients to the soil and helps curb the growth of weeds.



Guatemalan Coffees are 98% shade grown.



Source: Anacafé



Nearly half of the shade trees found on coffee farms belong to the *Inga* genus.



Gravilea (Grevillea robusta)

Shade Varieties

The shade structure of farms throughout Guatemala varies in complexity; from shade composed of several species of one genus, such as *Inga*, to more diverse systems that replicate the layers of a natural forest, incorporating fruit trees, hardwoods, and epiphytes like bromeliads and orchids.

Roughly half of the shade trees found on coffee farms belong to the *Inga* genus. *Inga* trees are indigenous to the region. Their rapid growth, tolerance of diverse soils, and broad shade canopy have made them favorites among coffee growers. Their pinnate leaves filter just the right amount of sunlight, and their fruit pods are an important source of food for local birds and wildlife. Among the most commonly found species of *Inga* are Chalum (*Inga micheliana*), Cushín (*Inga laurina*), Caspirol (*Inga fagifolia*), Cuje or Guaba (*Inga vera*), and Pepeto de Río (*Inga edulis*).

In Antigua and Fraijanes, however, *Gravilea* (*Grevillea robusta*) is the shade tree of choice. This evergreen, also known as Silky Oak, has narrow lance-shaped leaves that are smooth on the front and grayish-silver on the back. *Gravilea* trees are resistant to frost and grow quickly, providing the perfect cover for regions that experience cool nights.

Shade Structure

No shade →



Varied mono-shade
Multiple species of *Inga* →



Although most coffee grown around the world is cultivated without any shade cover, the shade structure of farms throughout Guatemala varies in complexity; from shade composed of several species of one genus, such as *Inga*, to more diverse systems that replicate the layers of a natural forest.

Diversified shade →



Alternative shade

In addition to Inga and Gravilea, many native species from each region are used on coffee farms as complementary shade or for their nutritional or economic value. As many as fifty-five species of trees have been identified on coffee farms throughout the country. In Cobán and New Oriente, for example, Madrecacao (*Glyricidia sepium*) is often found. This tree was once of great importance to the ancient Maya. It was originally used as shade for cacao as well as for its medicinal leaves, edible flowers, and hard wood. Today, Madrecacao provides shade for coffee along with a wide range of products including rodent poison from its roots, compost from its foliage, and wood for construction and cabinetwork.



Madrecacao (*Glyricidia sepium*)

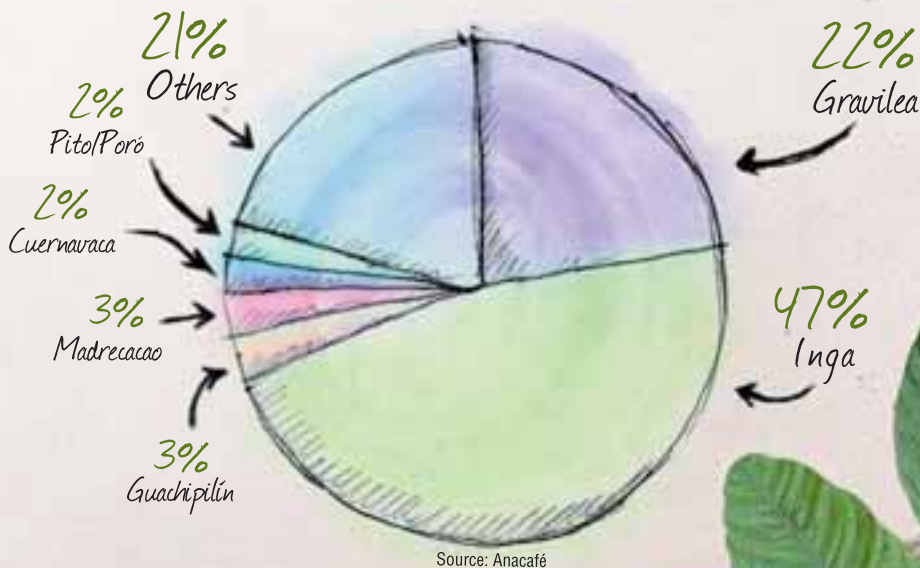


Palo Blanco (*Cybistax donell-smithii*)

Another favorite is the easily recognized Palo Blanco (*Cybistax donell-smithii*). When its large canary yellow flowers are in bloom, the Palo Blanco is the beautiful centerpiece of many farms. Its prized wood, also known as white mahogany, has a fine grain and makes beautiful furniture.

Not to be overlooked are the myriad of other plant and tree species found in and around coffee plantations such as banana, macadamia, avocado, and citrus. These are not only a source of food, but provide an important additional income to many farmers.

Guatemalan Coffees Shade Structure



There are more than 15 species of Inga trees used as shade on coffee farms. Among the most commonly found are *Inga micheliana* (Chalum), *Inga laurina* (Cushín), *Inga fagifolia* (Caspirol), *Inga vera* (Cuje, Guaba), and *Inga edulis* (Pepete de Río).



Inga micheliana (Chalum)



*Shaded coffee forest
in Huehuetenango.*

Creating a Coffee Forest



Guatemala's thirty-eight million shade trees and coffee plants create a forest that extends approximately 270,000 hectares and makes up 6.4 percent of the national forest cover. These forests are not only significant in size, they are also strategically placed. Located on the steep mountain ranges in the primary water recharge areas, coffee forests help safeguard the country's vulnerable ecological health. From protecting watersheds and reducing erosion to storing and recycling nutrients, the goods and services these forests provide go far beyond coffee beans.

Environmental goods and services provided by coffee forests

Goods

- Coffee
- Wood for construction, furniture
- Firewood, charcoal, organic leaf matter
- Fruits, flowers, ornamental plants
- Seeds, edible plants, nuts
- Medicinal plants
- Honey
- Oils, tannins
- Materials for handicrafts



Guatemala's coffee forests cover more than **270,000 hectares**.



Services

- Preservation of soil and soil fertility
- Nitrogen and carbon fixation
- Purification of air and water
- Regulation of hydrologic cycles
- Conservation of biodiversity
- Natural beauty
- Recreation and ecotourism
- Mitigation of floods and droughts

Coffee farms make up **6.4 %** of the national forest.

Benefits of the Coffee Forest



The health of an ecosystem can be measured in large part by the condition of its soil and water. Coffee forests directly affect both. To understand this complex relationship, it is first necessary to get to know the land and its water.

Rich mineral soils

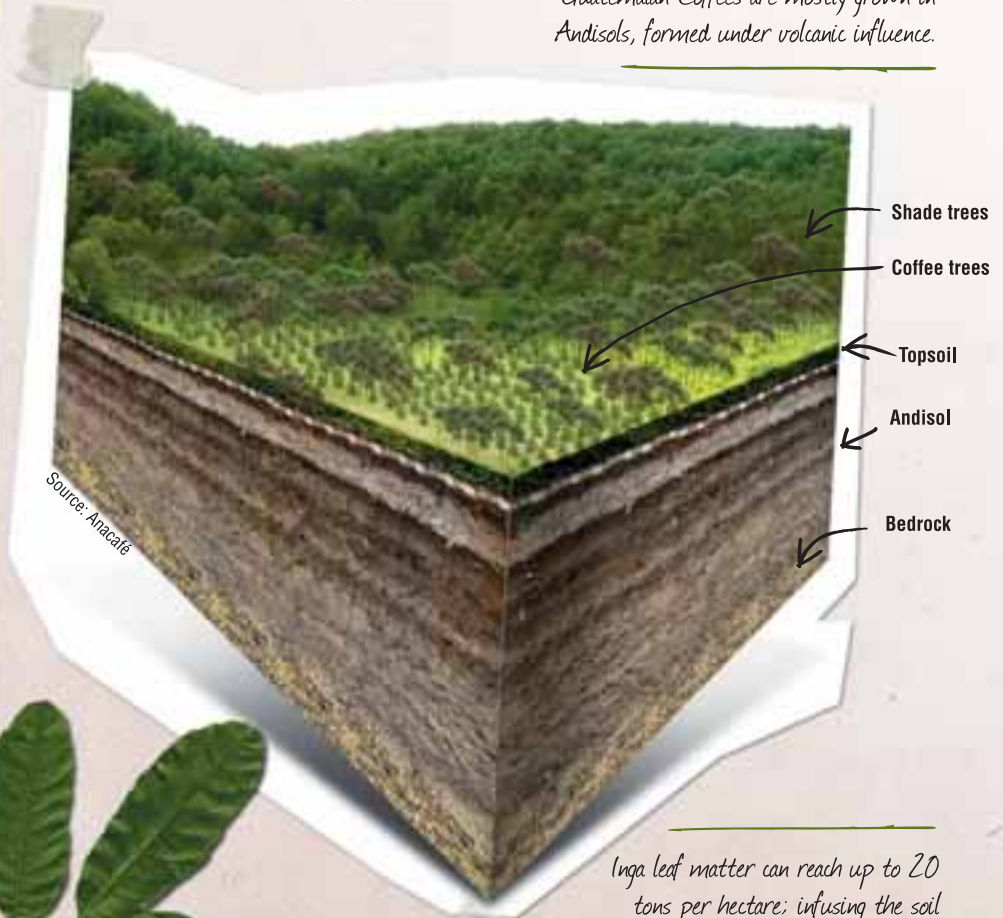
A legacy of volcanic activity has blessed Guatemala's coffee regions with rich mineral soils. Soil takes thousands of years to build up and is a force for life. It nourishes plants, consumes waste, and regulates gases such as carbon, nitrogen, and sulfur.

Guatemala's soils are primarily classified as Andisol and Inceptisol. **Andisols** are young, fertile soils found in less than 0.75 percent of the earth's non-polar land area. Formed from volcanic ash and lava, Andisols drain well and provide essential phosphorous to coffee plants.

Inceptisols are young, finely textured, clay-rich soils. They develop mostly on steep slopes where natural soil erosion continuously adds a layer of topsoil. Their unique combination of properties, that includes water, makes them especially suitable to retain humidity.

The soil in coffee-growing regions is topped by a thick layer of organic material in various stages of decomposition. This rich, black topsoil, more than 8 inches (20 centimeters) deep, makes Guatemala perfectly suited for agriculture.

Guatemalan Coffees are mostly grown in Andisols, formed under volcanic influence.



Inga leaf matter can reach up to 20 tons per hectare; infusing the soil with over 274 pounds (124 kilograms) of nitrogen during the rainy season and 147 pounds (67 kilograms) during dry periods.

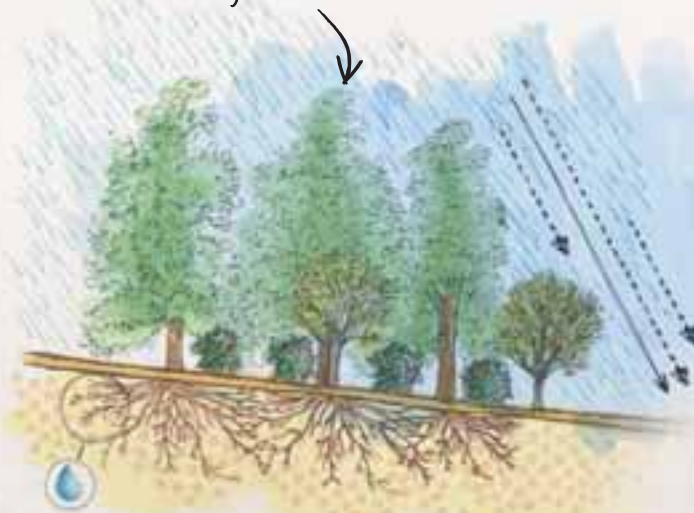


Soil Conservation

But how have Guatemala's soils fared after two centuries of widespread coffee cultivation? The answer is surprisingly positive. The credit goes primarily to the extensive forests found on coffee farms which continuously conserve and nourish the soil.

Rainwater runoff is the leading cause of soil erosion and degradation. Forests counteract this problem by acting as a sponge, soaking up rain and moisture and releasing it at regular intervals. The multileveled structure found on coffee farms, made up of shade trees, epiphytes, coffee plants, and mulch, breaks the force of a downpour, allowing water to trickle down into branches, trunks, and roots. The remaining water then seeps into streams, rivers, and aquifers before evaporating back into the air. This extraordinarily efficient process, known as the hydrologic cycle, in conjunction with the natural action of forests, dramatically reduces erosion. Scientists have found that Guatemala's coffee forests prevent as much as 26 million tons of soil from eroding every year.

Multiple layers of vegetation like shade trees, coffee plants, and moss break the force of a downpour, significantly reducing soil erosion and leaching.

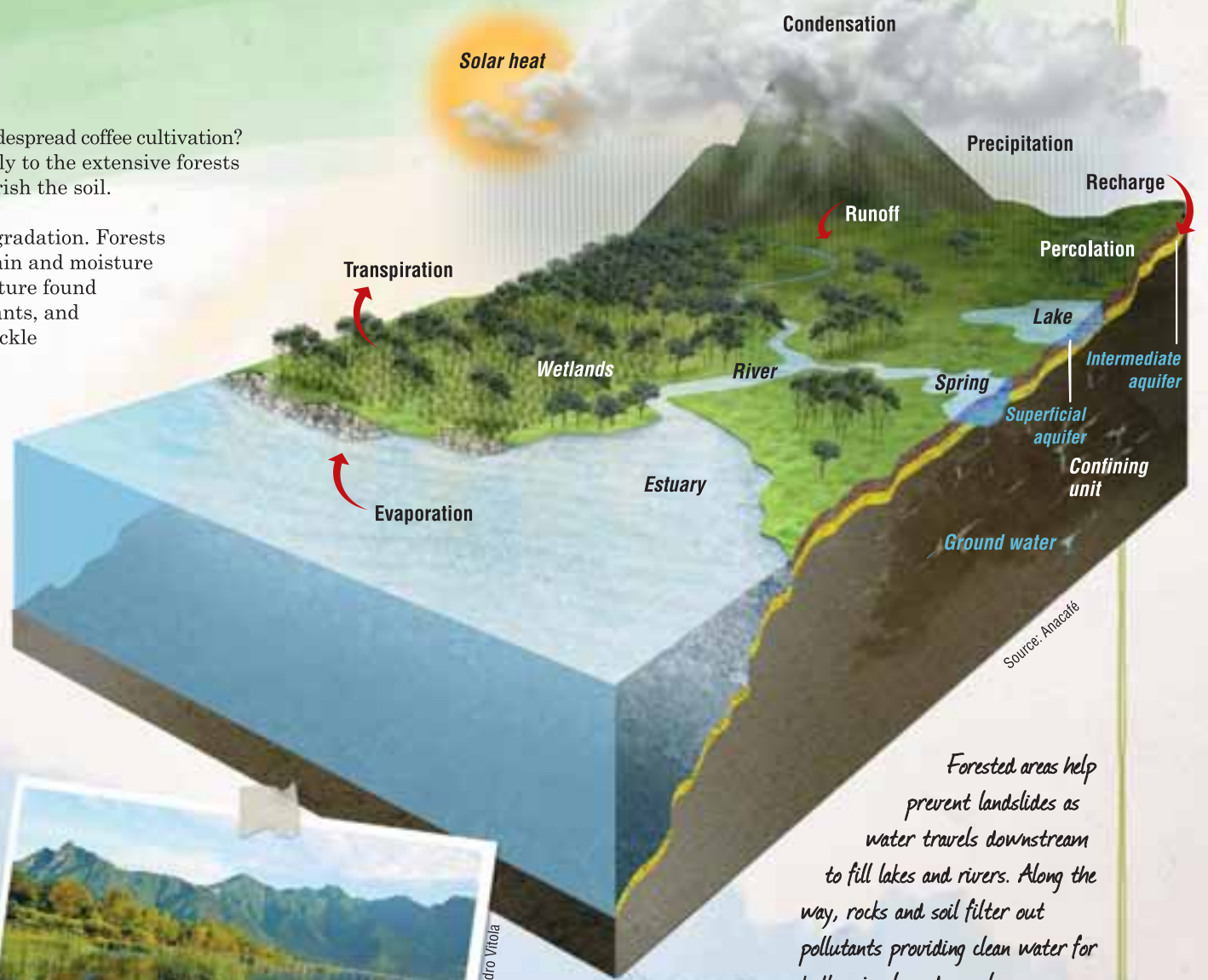


Through their leaves, trees transpire large amounts of water back into the atmosphere where new rain clouds are formed and the hydrologic cycle begins again.

Water is slowly captured and cleansed through layers of soil and roots before being deposited in aquifers, rivers, and streams.



Photo by Alejandro Vitola



Forested areas help prevent landslides as water travels downstream to fill lakes and rivers. Along the way, rocks and soil filter out pollutants providing clean water for both animals and people.



Coffee forests and soil protection

Coffee forests not only protect the soil, they help nourish it. The roots of shade trees reach deep into different soil layers bringing up a variety of nutrients that are then transported to the leaves. Although Ingas (*Inga spp.*) are evergreens, they constantly drop their leaves creating a dense layer that infuses the soil with nitrogen. This natural fertilization accounts for more than 30 percent of the nitrogen requirement of coffee plants.

Photo courtesy of Oscar Díaz Echeverría

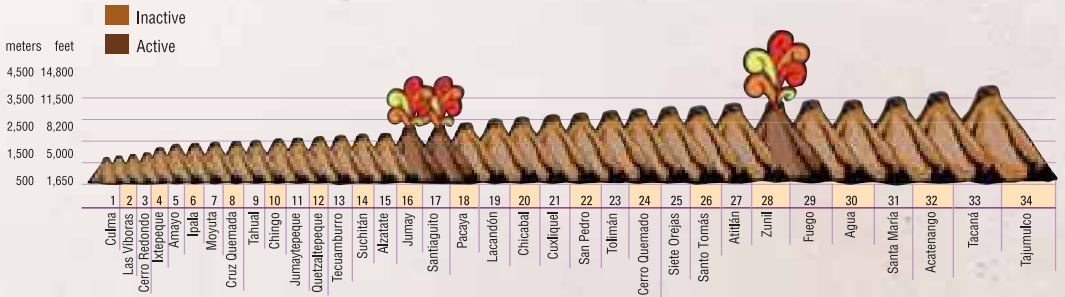
Guatemala's Ring of Fire

Guatemala's distinctive volcanoes define the panorama as well as many of the coffee producing regions. Front to back: Agua, Acatenango with the adjoining Fuego, Atitlán, San Pedro, Zunil, Santo Tomás, Santa María, Tajumulco, and Tacaná volcanoes provide a glimpse of Guatemala's fiery chain.



Source: Anacafé / INSIVUMEH

Guatemala's "coffee belt" runs along the volcanic chain, benefiting from its distinct microclimates and mineral rich soils.



For many people, especially geologists and world travelers, Guatemala's most distinctive geographic feature is its chain of 34 volcanoes—part of the Ring of Fire—that runs parallel to the Pacific Ocean. In prehistoric times, violent volcanic activity shaped Guatemala's mountainous terrain and created the highland's major bodies of water. Today, volcanoes are intimately linked to coffee cultivation.



Active Santiago with the towering Santa María volcano behind.

Guatemala's Abundant Water Supply



Moss, jade, emerald, sage, pea—the shades of green found throughout Guatemala are endless. A country with so much green must be blessed with abundant water—and Guatemala is. With three main slopes that drain into the Pacific, Atlantic, and Gulf of Mexico, Guatemala's plentiful water flows into aquifers, over thirty-five major rivers, and more than a thousand lakes and lagoons.

It is no coincidence that more than 85 percent of coffee farms lie within Guatemala's primary water recharge area, home to twenty-five of the country's thirty-five watersheds. When farmers first began cultivating coffee in the nineteenth century, they chose lands close to rivers to facilitate processing and to generate energy. Furthermore, by establishing their farms among the

mountains that crisscross the country, they also ensured abundant rains for their crop.

Humidity from the Pacific and Atlantic oceans is trapped by the towering volcanoes and mountains of the coffee-growing regions. Rising 4,300 to 6,500 feet (1,300–2,000 meters), these majestic slopes create a barrier, converting moisture into abundant rainfall ranging anywhere between 32 to 200 inches (800–5,000 millimeters) a year.

All together, the coffee forests contribute significantly to Guatemala's water resources by supplying approximately 3 billion cubic meters of water a year to the hydrologic cycle. More importantly, coffee forests cleanse the water, making it drinkable for people in the surrounding areas.

Close to 3 billion cubic meters of water are supplied yearly to the hydrologic cycle by coffee forests.

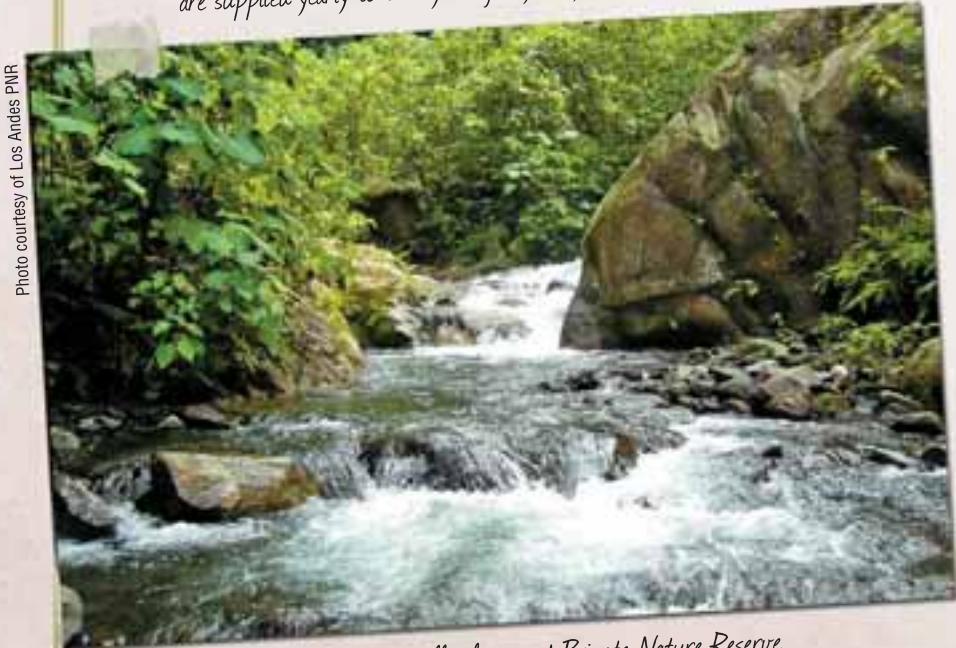


Photo courtesy of Los Andes PNR

Gushing water at Los Andes coffee farm and Private Nature Reserve.

Water Resources

- River
- Lake
- Coffee Growing Area



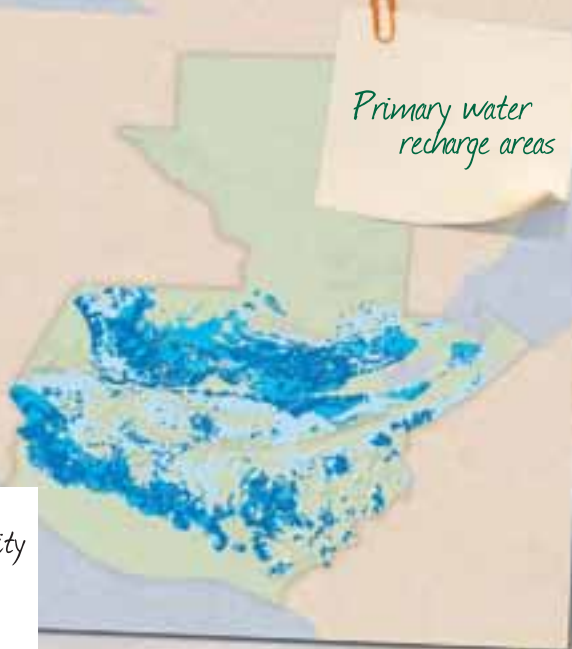
Source: Anacafé / MAGA

More than 85% of coffee farms lie within Guatemala's primary water recharge areas.

Primary water recharge areas

Water recharge area
An area of land where surface water filters down to replenish an aquifer, lake, stream, or marsh.

- Area's recharge capacity**
- Very High
 - High
 - Medium



Source: INAB

The Wet Method

Due to the country's extensive water resources, coffee is processed using the wet method. In Guatemala, mills can be found almost anywhere. There are over five thousand processing mills throughout the country, allowing farmers to depulp coffee the same day it is picked—a key factor in ensuring quality.

The wet process uses water and gravity to remove the outer layers of the bean while simultaneously sorting for quality. During the processing stage, known as the *beneficiado*, a year's worth of field work comes to fruition.



1. Crimson cherries are handpicked in the field, one by one. The cherries that are not a mature red are left for subsequent passes. If the cherries are too green, the coffee tastes like grass; too ripe and it tastes almost like vinegar. The entire picking process requires several months of careful selection.



2. Before milling, another color check is done to ensure that only the beans with the optimum ripeness are processed. The coffee is then collected and placed in a siphon filled with water. Since heavier beans are better beans, the ones that float are separated from those that sink.



3. The beans then go through a depulping machine where the red shell, called *pulpa*, is removed.



4. After depulping, the coffee is placed in tanks where it undergoes a natural fermentation process to remove the honey-like sugars of the bean called mucilage. This delicate process can take from six to forty-eight hours and must be monitored carefully to avoid the coffee becoming fruity or vinegar-like. A stick is inserted into the pile to see if the coffee is ready. If the circle holds, the coffee is ready to be washed. When rubbed together, the beans should make a crunchy sound in sharp contrast to the slimy texture before fermentation.

5. The coffee is immediately and thoroughly washed with clean water, making sure no traces of mucilage remain.



6. Another important step in selection and classification involves paddling the beans along a narrow channel filled with running water. At several intervals wooden slats are used to prevent the denser beans from continuing on the path, while lighter beans, called floaters, skim along the surface. This process is repeated until all floaters have been eliminated.



7. The purpose of drying is to reduce the humidity of the bean from 55 percent to 11 percent. Most coffee farms in Guatemala sun-dry their coffee. Some rainy regions, like Cobán, however, have to use mechanical driers to partially or completely dry their coffee. When sun-drying, the coffee must be turned over frequently and the layer of beans should be less than 2 inches (5 centimeters) deep. At this stage the bean turns a lovely hay color and is called parchment.



8. After a busy processing cycle, the coffee is left to stand in a warehouse until the final stage of milling. Leaving the coffee in its parchment state protects it from changes in humidity and temperature.



9. To reveal the famed jade green coffee bean, the parchment covering must be removed. A dehuller removes the parchment husks. Often the coffee is sorted again either by weight, color, or size. Afterwards, the coffee is placed in burlap sacks ready for shipping and roasting.



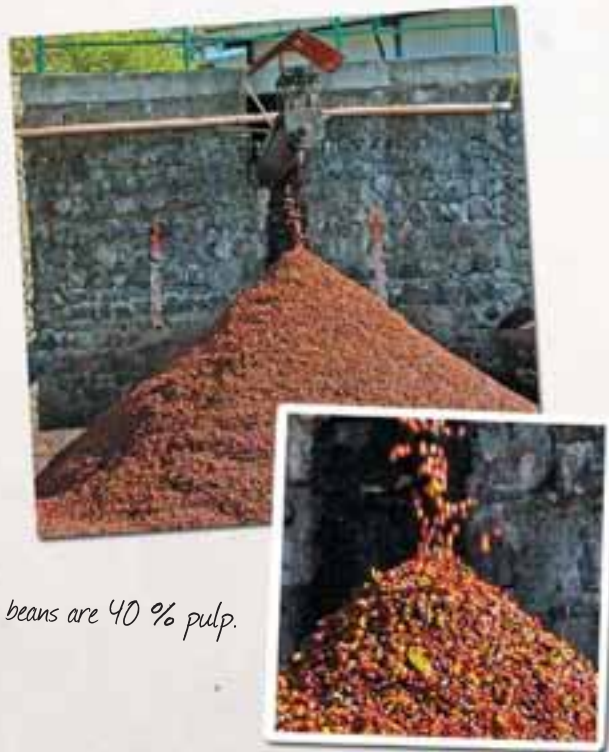
A Clean Finish

Focusing on Residual Products

For several decades, Anacafé has worked with farmers to reduce the environmental impact of coffee processing. But it was not until recently that residual products were seen as resources rather than waste. This change implies more than a creative use of words. Thanks to extensive research, the many uses and reuses of solid (pulp) and liquid (mucilage waters) byproducts are becoming well known. The goal: to help farmers complete the cycle of coffee production with a clean finish.

Pulp fiction

In order to extract the bean, the red cherry's pulp must be stripped away. Since coffee is 40 percent pulp, one day of milling can generate a considerable amount. But what can be done with it? Coffee pulp is in fact a great fertilizer. After composting it for three months, it may be applied directly to the base of the plant. Anacafé began recommending this practice in the 1970s. Today, over 90 percent of Guatemala's coffee farmers use pulp to nourish their plants.



Coffee beans are 40 % pulp.

Wiggle your way to something better

What if there was a way to convert garbage into food? Although it may sound too good to be true, it is exactly what earthworms do. All organic matter eventually decomposes. Worms accelerate this natural process by feasting on organic waste and excreting a nutrient-rich product called humus. In fact, humus contains five times more nitrogen and potassium, seven times more phosphorous, and twice the calcium than the material ingested by the worm. In just four months, roughly one hundred thousand worms can convert a one-car-garage full of organic waste, such as coffee pulp, into 1,350 pounds (613 kilograms) of the best fertilizer found anywhere. Not bad for a bunch of worms many thought were only good for fish bait.



Cleaning up their act

During the fermentation process, mucilage is removed with the help of naturally occurring bacteria. However, as the beans are washed, the remaining bacteria contaminate the residual water by altering pH levels and depleting the available oxygen. If inadequately discarded, residual waters can severely damage soils and waterways.

Since 2006, with the passing of a residual waters act, the Guatemalan government requires residual waters and solids be disposed of or reused in an environmentally conscious manner. Today, there are as many water treatment plants being built around the country as had been in existence several years earlier. Increased awareness, education, and changes in public policy have spurred the growing trend to use these products which were once considered waste.

Reduce and reuse

A traditional coffee mill can consume up 530 gallons (2,000 liters) of water to process 100 pounds (45.4 kilograms) of parchment coffee. Since a large portion of the water is used to transport and depulp coffee, there is an opportunity to both decrease and reuse the water needed without affecting quality. By providing appropriate training and technical support to redesign mills, Anacafé has helped producers reduce water consumption to a paltry 40 gallons (150 liters) per 100 pounds.

Doing well

In this method, ditches with an incline of 1 percent perpendicular to the terrain carry residual water to a series of wells located 33 feet (10 meters) apart. With a capacity of 1 to 1.5 cubic meters, the wells slowly absorb the water, allowing the remaining mucilage to be trapped in the pores of the walls where it can be removed and used in composting.



Photo by Alejandro Vitola

Mucilage is trapped in the pores of the walls where it can be removed and used in composting.

A Symbiotic Relationship

Across the country, from the Maya jungles of Petén in the north to the rugged volcanic slopes of the south, dedicated farm owners and communities have designated more than 50,000 hectares of land as Private Nature Reserves.

These dynamic agroforestry systems focus on sustainable development as a way to protect natural resources. Under this model, agricultural products like coffee, cacao, ornamental plants, and others are cultivated within or alongside natural forests. The forest provides environmental goods and services to the farm, such as timber and water recycling, while the farm supplies the necessary income to protect the forest.

But these managed habitats provide more than just a way to make a living, they create life. The patchwork structure of

forests and agricultural lands form biological corridors with a wealth of biodiversity, second only to undisturbed forests. The coffee forests also ensure the survival of many species, functioning as critical stepping stones for insects, birds, bats, and other creatures as they move from one ecosystem to another.

Thanks to increased awareness and education, a growing number of farmers are designating their lands as Private Nature Reserves. Since it was established in 1998, the Private Nature Reserve Association of Guatemala (*Asociación de Reservas Naturales Privadas de Guatemala*) has taken a leadership role in promoting environmental conservation through the creation of private reserves. Working alongside international organizations, government entities, farm owners, and communities, the association has succeeded in balancing the needs of both man and nature.



A Private Nature Reserve (PNR) is a privately held, legally recognized forested area of vital importance for the protection and management of water and land resources as well as biodiversity.

Photo by Ricardo Mata, courtesy of La Isla PNR



Today, there are 114 Private Nature Reserves throughout Guatemala, a number that grows by 30% each year. Above, the lush forest of La Isla PNR in the south of the country.

A Model for Coffee Production



Atitlán Cluster

- | | |
|------------------------|-------------------------------|
| 1. Los Castaños | 14. Los Trrales |
| 2. Milán y Anexos | 15. Santa Isabel |
| 3. Monte Quina | 16. San Jerónimo Miramar |
| 4. Las Maravillas | 17. Santa Teresa |
| 5. Monte de Oro | 18. El Porvenir |
| 6. Mocá | 19. La Providencia |
| 7. Reserva del Quetzal | 20. Santo Tomás Perdido |
| 8. Los Andes | 21. Pampojilá |
| 9. Panamá | 22. Santo Tomás Pachuj |
| 10. Santa Adelaida | 23. San Bernardino/ECA Xejuyú |
| 11. San Luis Palmira | 24. El Retiro |
| 12. El Vesuvio | 25. Buenaventura |
| 13. La Chusita | |

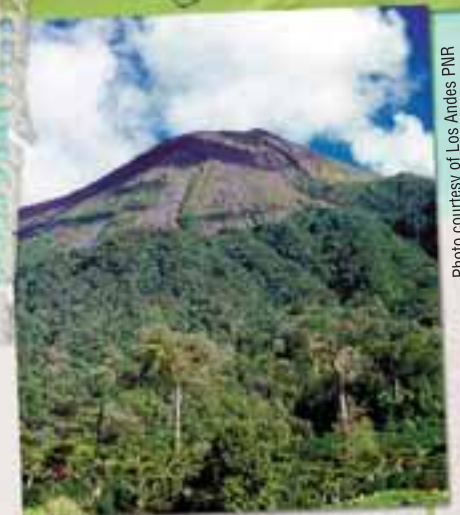


Photo courtesy of Los Andes PNR

Corridor for life: the Atitlán volcano.

Atitlán's Private Nature Reserves provide an innovative model for future coffee production. Covering more than 6,000 hectares of protected forests, from the peak of the Atitlán volcano down to the Pacific plain, these reserves create a corridor that incorporates multiple ecosystems and provides excellent opportunities for ecological and economic sustainability. Here, farm owners and communities cultivate high-quality coffee while actively managing the area's natural resources.

The pristine shaded coffee forests of Atitlán's Private Nature Reserves create a habitat for local wildlife like the rare Horned Guan (*Oreophasis derbianus*), the endemic Azure-rumped Tanager (*Tangara cabanisi*), the famed Quetzal (*Pharomachrus mocinno*), Wary Deer (*Mazama americana*), and more than ninety species of migratory birds.

By protecting the biodiversity of the region, Private Nature Reserves also preserve Atitlán's scenic beauty, offering multiple opportunities for ecotourism.



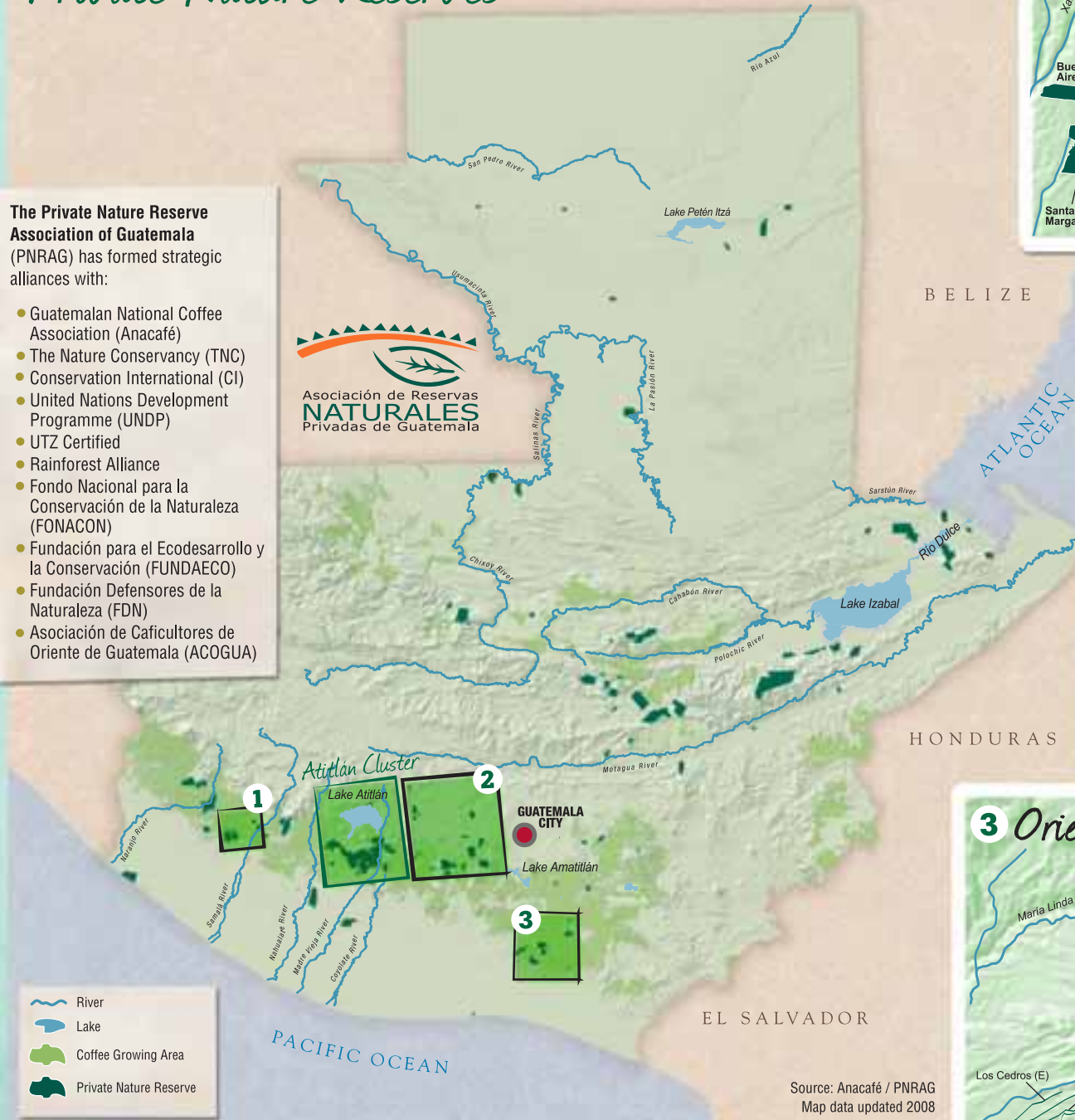
"Farm owners are dedicated conservationists who have linked the protection of natural resources with ecotourism and economic productivity with a vision rarely seen in other countries."

-Robert Rice
Research Scientist
Migratory Bird Center, Smithsonian

Private Nature Reserves

The Private Nature Reserve Association of Guatemala (PNRAG) has formed strategic alliances with:

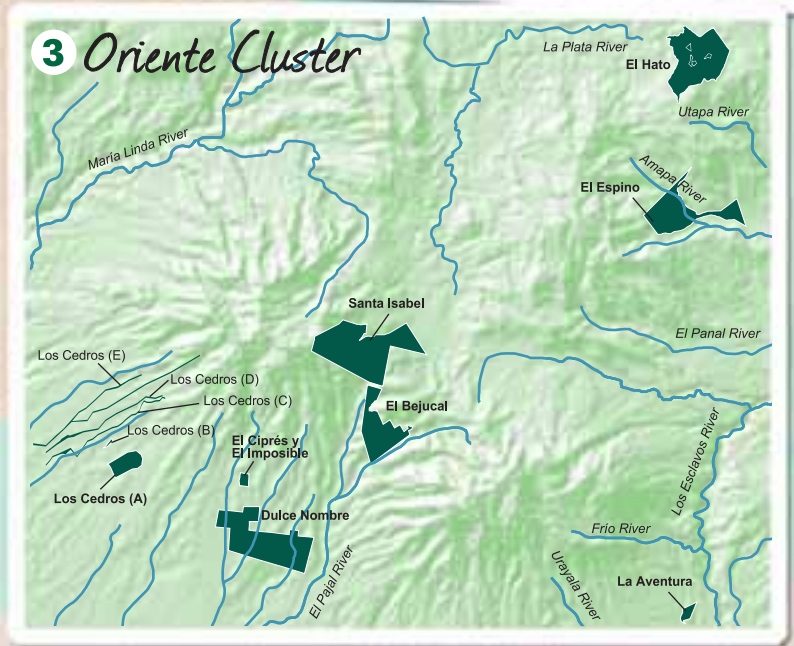
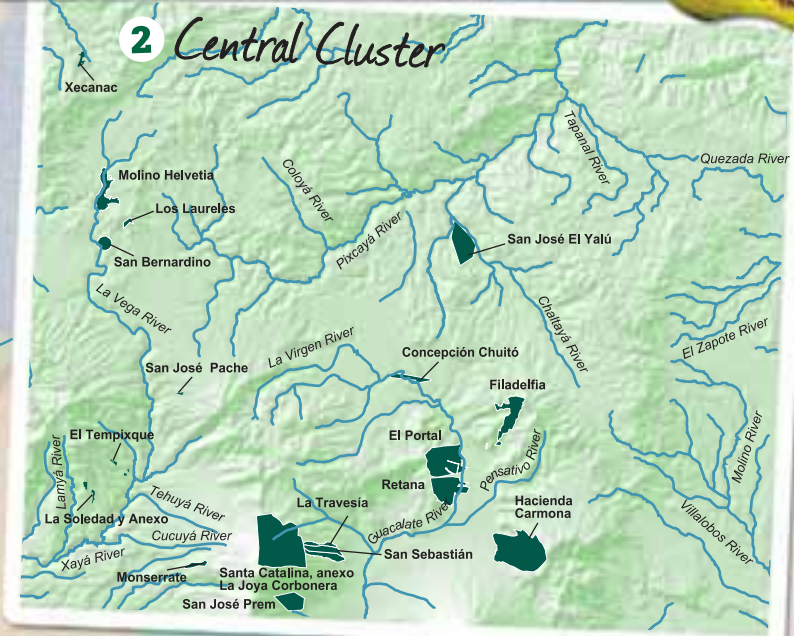
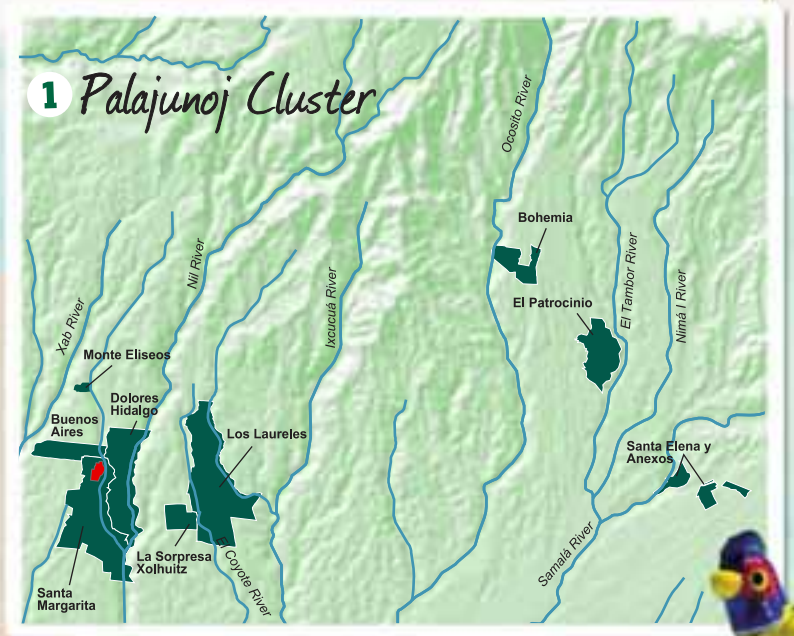
- Guatemalan National Coffee Association (Anacafé)
- The Nature Conservancy (TNC)
- Conservation International (CI)
- United Nations Development Programme (UNDP)
- UTZ Certified
- Rainforest Alliance
- Fondo Nacional para la Conservación de la Naturaleza (FONACON)
- Fundación para el Ecodesarrollo y la Conservación (FUNDAECO)
- Fundación Defensores de la Naturaleza (FDN)
- Asociación de Caficultores de Oriente de Guatemala (ACOGUA)



Source: Anacafé / PNRAG
Map data updated 2008

"Coffee is a noble crop which can coexist within the forest system."

-Federico Fahsen
President, PNRAG



Refuge for Biodiversity

Guatemala is located in Mesoamerica, one of the world's hotspots for biodiversity. Over three million years ago, when Central America was formed, species that had up until then evolved independently in North and South America converged, producing the region's unique and diverse array of life. Guatemala's volcanic and mountainous landscape also facilitated the isolation of certain species, giving rise to plants and animals unique to the country.

Coffee forests—The ultimate habitat

The question then is how to preserve and manage this bounty of flora and fauna. One way is by creating diverse habitats. Agroforestry systems, like coffee, form complex ecosystems that significantly support biodiversity from the ground up. First, the abundant leaf and weed layer houses a variety of insects, including up to thirty species of ants. Next, a host of epiphytes, like orchids and bromeliads, mosses, ferns, and lichens at mid-level contain arthropod diversity comparable to that found in tropical tree canopies. Finally, diverse layers of shade trees, including Inga (*Inga spp.*), provide shelter, seasonal fruits, and flowers.

The resulting ecosystem naturally attracts a host of larger organisms such as butterflies, bats, birds, amphibians, and reptiles, offering a critical habitat in the region.

Butterflies

Butterflies are unique to their habitats, feeding on a small group of plants and migrating within defined areas. Their presence, therefore, can be a good indicator of plant diversity. A study in Quetzaltenango, in western Guatemala, found more than eighty species of butterflies on coffee farms, including the rare *Dircenna chiriquensis*, *Cissia tiessa*, *Danaus plexippus*, *Manataria maculata*, and *Taygetis andromeda*. Surprisingly, the butterflies seemed to prefer the diverse coffee forest to the native forest, as indicated by larger populations and more varieties.



Cissia tiessa



Dircenna chiriquensis

Bats

What bats lack in beauty they make up for in usefulness. Up to twenty-four species of bats have been found on shaded coffee farms. Bats are critical to pollination and dispersion of tropical seeds, 95 percent of which need to be dispersed by animals. They also help to control nocturnal insects, many of which are agricultural pests. But in order to survive, bats need the diversity of coffee forests to feed on insects and fruits as well as tree cover to protect themselves from predators.

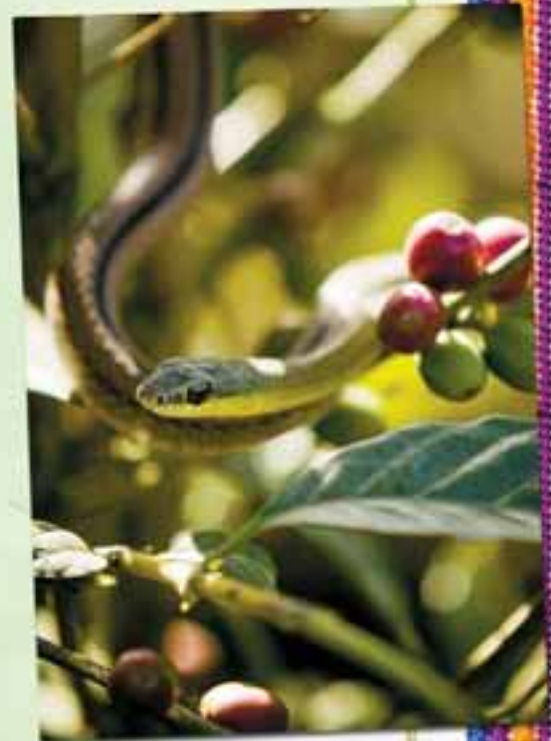


Bat nap on a bougainvillea bush at Bohemia coffee farm and PNR.

Photo courtesy of Bohemia coffee farm

Amphibians and reptiles

Mesoamerica has great reptile and amphibian diversity and endemism. Guatemala alone is home to more than three hundred species of amphibians and reptiles, making the region one of the richest in Central America. Here, diverse shaded coffee systems play a vital role, creating important microhabitats for feeding, breeding, and survival between forest patches. Some of the animals found in the coffee forests of the Pacific region include a range of snake genus, amphibians like the tree frogs (*Plectrohyla matudai*), the rainy frog genus *Eleutherodactylus*, and lizards such as the colorful Rainbow Ameiva (*Ameiva undulata*).



Emerald Striped Racer (Dryadophis dorsalis)



The tree frog (Plectrohyla matudai)

Agroforestry systems, like coffee, form diverse ecosystems that support biodiversity.

Under the lens

Fuzzy caterpillars, long-legged grasshoppers, hard-shelled beetles, and slimy colorful slugs are just a few of the thousands of species of tiny life that can be found on Guatemala's coffee farms. Far from bugging farmers, many of these arthropods act as predators to coffee pests, recycle biological material, create topsoil, and provide food for larger animals like birds and bats.



Photos by Alvaro Hernández

Where the Birds Are

From the emerald green feathers worn by ancient Maya rulers to the wide-eyed ceramic owls sold today at local fairs and markets, Guatemala's art and culture reflect an enduring fascination with birds. And it is no wonder. With over seven hundred species, including more than forty endemic to the region, there is no better example of Guatemala's biodiversity than its beautiful birds.

Some are very rare, like the red Horned Guan (*Oreophasis derbianus*), others adorable, like the Pink-headed Warbler (*Ergaticus versicolor*). These, along with a multitude of owls, trogons, orioles, tanagers, hawks, and brightly-colored hummingbirds make their home in this small country. But it is the elusive Quetzal (*Pharomachrus mocinno*) that captures everyone's imagination. With its spectacular tail feathers, scarlet chest, and majestic flight, it earned godly status among the ancient Maya. Today, it is the national bird and a symbol of liberty.

Miniature marvels

Jampacked beauty in a thumb-sized body. The hummingbird is a marvel of splendor and engineering. It can flap its wings an astonishing eighty times per second as it dives to retrieve nectar. But inside their delicate frame, hummingbirds are feisty and fiercely territorial.

Surprisingly, hummingbirds are native only to America with 95 percent of species occurring south of the United States-Mexico border. Guatemala's flower-strewn mountains and coffee farms are a paradise for hummingbirds, who may need to feed as often as every few minutes.



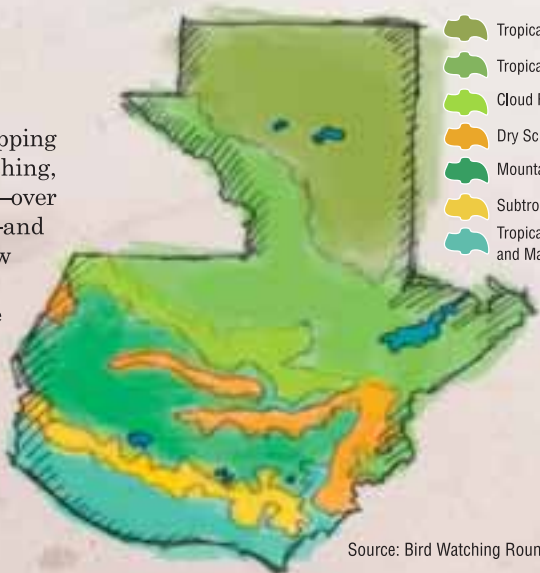
Photo by José Yee

The Wine-throated Hummingbird in all its splendor.



Watch the birdie

Guatemala is a show-stopping destination for bird watching, known both for diversity—over seven hundred species—and accessibility. In just a few hours, bird enthusiasts can travel through three ecosystems, seeing a variety of species from tropical parakeets to mountain hawks.



Diverse Ecosystems

- Tropical Humid Forest
- Tropical Rain Forest
- Cloud Forest
- Dry Scrub
- Mountain Forest
- Subtropical Humid Forest
- Tropical Humid Savannah and Mangroves

Endemic species

Horned Guan

(*Oreophasis derbianus*)

The only survivor of the ancient lineage of Cracids, this turkey-like bird is considered endangered. A resident of humid forests, the Horned Guan feeds on fruit, green leaves, and invertebrates. Its booming *uhm uhm* call and red horn of bare skin make it unmistakable.



Photo by Josué de León / Luis Montes

Photo by José Yee



Resplendent Quetzal

(*Pharomachrus mocinno*)

One of the most revered animals among the ancient inhabitants of Mesoamerica, the Quetzal figures prominently in the region's history and mythology. During mating season, the male's signature twin tail feathers grow up to a meter—four times its body length—making for an awesome sight in the cloud forest.

Altamira Oriole

(*Icterus gularis*)

Known for their distinctive long, woven nests. Both male and female Altamira Orioles have bright coloring. They feed mainly on insects and berries.



Blue-throated Motmot

(*Aspatha gularis*)

Long associated with cloud forests, the Blue-throated Motmot has a loud distinctive call which can be heard up to 1,600 feet (500 meters) away. Shy and elusive, Blue-throated Motmots tend to perch in the low understory of the forest.



Photo by José Yee

Rufous Sabrewing

(*Campylopterus rufus*)

Known as the "coffee hummingbird" for its occurrence on coffee farms. This large hummingbird has a long curved bill and was first documented in Guatemala in 1840.



Royal Flycatcher

(*Onychorhynchus coronatus*)

When exhibiting its crimson, fan-shaped crest the Royal Flycatcher lives up to its noble name. Although usually quiet, the Royal Flycatcher sometimes gives a repeated sharp, clear *pree-o* or *key-up*. This bird can be seen putting on a show in Alta Verapaz where Rainforest Cobán coffee is grown.



Photo by Knut Eisermann

Photo by José Yee



Pink-headed Warbler

(*Ergaticus versicolor*)

This lovely pink and red warbler is known for its bouncy flight and melodic voice. It lives in a small range of forests near the Tacaná volcano in San Marcos.

Ferruginous Pygmy Owl

(*Glaucidium brasilianum*)

This hand-sized owl has a large, round head and is mostly active at dusk and dawn. It feeds primarily on insects with an occasional bird or lizard. It nests in natural tree cavities, old woodpecker holes, or tree forks.



Home away from home

Many of Guatemala's coffee-producing areas are located within the unique ecosystems of several bird species and along three of the Western Hemisphere's four major trans-regional migratory bird routes.

For more than ninety species of migratory birds, like the endangered Golden-cheeked Warbler (*Dendroica chrysopharia*) and the lovely Scarlet Tanager songbird (*Piranga olivacea*), Guatemala's coffee forests provide essential bridges between patches of native forest. Within this complex vegetation system, which includes the predominant shade tree Inga (*Inga spp.*) and extensive flora, migratory birds find

important sustenance. Inga trees offer fleshy white fruit, flowers, moss, and insect-filled epiphytes to North American migrants including the famed Baltimore Oriole (*Icterus galbula*) and the nectar-loving Tennessee Warbler (*Vermivora peregrina*). For those birds that choose to nest during their stay, trees like the Guayabo (*Psidium guajava*) provide cozy shelter.

As birds continue to face steadily declining habitats, coffee forests become increasingly important sanctuaries, offering long-distance travelers, like the Rose-breasted Grosbeak (*Pheucticus ludovicianus*) a perfect home away from home.



Black-throated Green Warbler
(*Dendroica virens*)

A native of northeastern coniferous forest, the Black-throated Green Warbler has a dark black bib and bright yellow face that are unique among East Coast birds. Its buzzing *zoo-zoo-zee* song can be heard on many coffee farms.

Ruby-throated Hummingbird
(*Archilochus colubris*)

The Ruby-throated Hummingbird is the only hummingbird that breeds in eastern North America. This amazing bird arrives in Central America after a remarkable non-stop, twenty-hour crossing of the Gulf of Mexico. It beats its wings an impressive fifty-three times per second, hovering over flowers and catching insects mid-flight.



Photo by José Yee



Cooper's Hawk
(*Accipiter cooperii*)

A fearsome predator, the Cooper's Hawk captures birds with its feet, squeezing the prey to its death. It has also been seen drowning its victims. Originating in several regions in the United States and Canada, Cooper's Hawks migrate from late August to early November.

Olive-sided Flycatcher
(*Contopus cooperi*)

This stocky flycatcher migrates from Canada and the western United States. It is often seen hastening from its high perch to catch flying insects and then returning to the same spot.



Tennessee Warbler
(*Vermivora peregrina*)

Sometimes referred to as the "coffee warbler" because of its affinity for shaded coffee farms, this dainty bird originates in the Canadian forests, not Tennessee. During its wintering in tropical forests, the Tennessee Warbler cleverly steals nectar by piercing flower tubes at the base, rather than performing the more difficult task of pollination.



Yellow-throated Vireo
(*Vireo flavifrons*)

This unique, bright yellow Vireo is a solitary bird on migration, traveling from the eastern United States down to Mexico and Central America. During its wintering, the Yellow-throated Vireo feeds on arthropods, some fruits, and seeds.



Photo by José Yee

Rose-breasted Grosbeak
(*Pheucticus ludovicianus*)

This melodious bird, with a voice similar to a robin's, flocks to Central America for the winter where it can be seen hovering and hopping along branches using its large bill to feed on fruit and seeds.



Painted Bunting
(*Passerina ciris*)

The male Painted Bunting's colorful plumage is unmistakable as it migrates from two different regions, one in the central United States and the other along the southeastern seaboard. The males are highly territorial and aggressive, capable of pecking and fighting to the death.



Migration Routes



Towards a Greener Future

In the biggest challenge facing mankind in the twenty-first century—how to protect the environment—the future begins today. Tomorrow might just be too late. Guatemala's coffee forests have proven they contribute greatly to the health of the country's soils, water, and biodiversity. But what about two of the biggest environmental players—carbon and energy? As it turns out, coffee forests take care of those too.

Carbon

Without the right amounts of carbon dioxide (CO₂) in the atmosphere the earth would freeze; too much, however, and the planet heats up, throwing delicate climate patterns out of balance. Carbon is an essential chemical found in all living things. In the carbon cycle it moves efficiently through four reservoirs: the biosphere, atmosphere, hydrosphere, and geosphere.

When the carbon cycle is disrupted, however, it resembles a clogged drain. Water can be poured in, but it has nowhere to go. The same occurs with carbon dioxide emissions. Releasing more CO₂ than ever-depleting forests can sequester leaves a surplus in the atmosphere. To compound the problem, CO₂ acts like a pane of glass, allowing the heat of the sun to enter the earth's atmosphere, but not escape. The results are increased temperatures and drastic climate change.

Your home is my home

It is well documented that carbon emissions heat the earth, affecting everyone regardless of their political boundaries.

Guatemala produces only 0.1 percent of global carbon dioxide levels, yet it plays a significant role in reducing worldwide emissions.

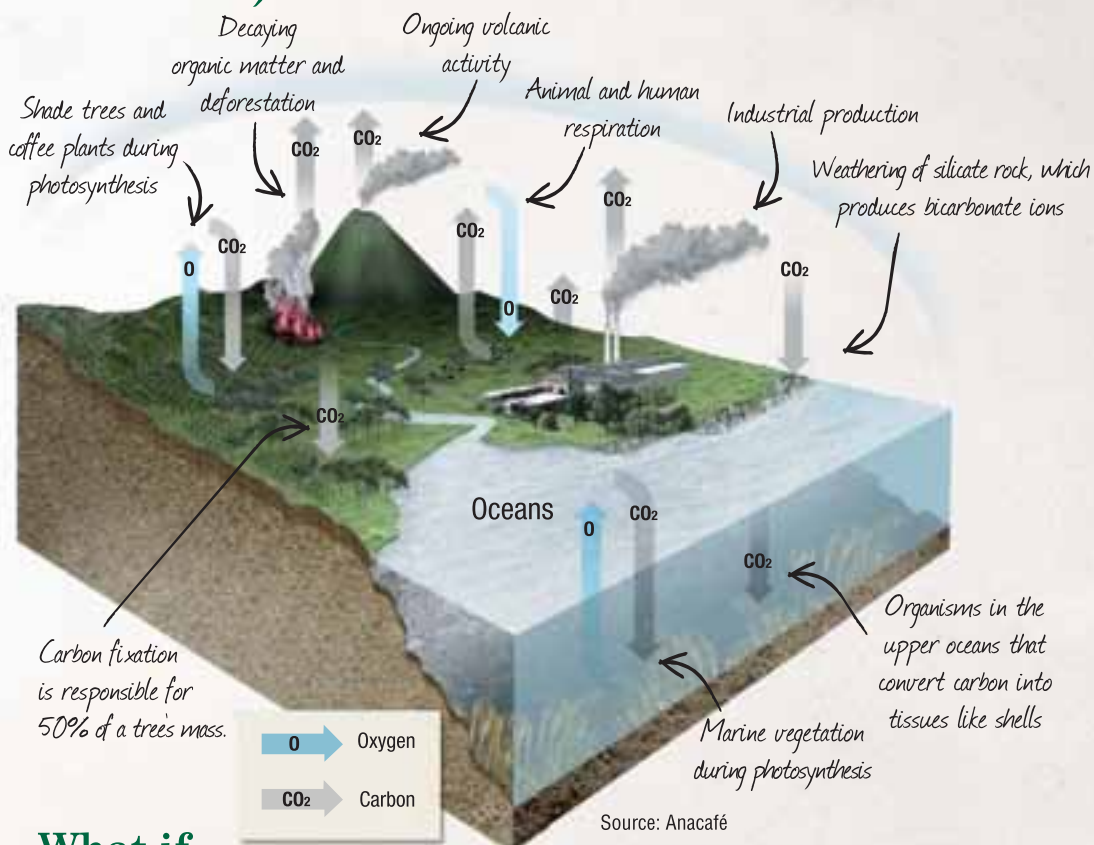
How? Its forests work in two ways. Through photosynthesis they take in CO₂ and release oxygen. A single tree can absorb up to a ton of CO₂ in its lifetime. Equally important, though, is the fact that forests fixate carbon in trees, soil, leaf matter, and vegetation.

Fix it

During photosynthesis trees and plants take in CO₂ and produce oxygen as well as sugars and other organic compounds needed for growth. Carbon fixation involves converting CO₂ into organic material. In a tree, for example, the carbon is turned into wood, accounting for roughly 50 percent of the tree's mass. As long as the tree is not cut down or burned, it effectively prevents the carbon from being released into the atmosphere.

Where the tree is planted also matters: a tree growing in a tropical zone at a high altitude fixates more carbon than one planted in say, Canada. To help mitigate climate change, Guatemala's coffee farms are at the right place at the right time. The coffee forest system covers more than 270,000 hectares and stores 24 million tons of CO₂.

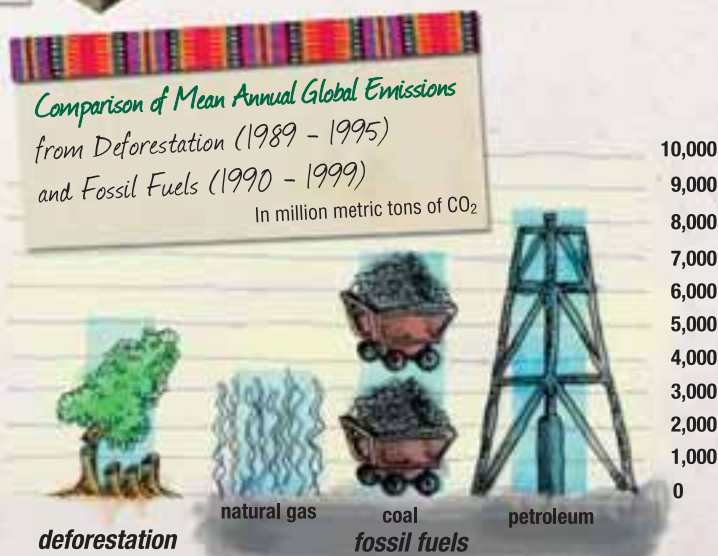
Carbon Cycle



What if...

Deforestation is one what-if scenario we don't like to imagine, but it is a growing reality. Throughout the developing world, economic hardships have led to the burning and clearing of forests. Tropical deforestation accounts for roughly 20 percent of all CO₂ emissions attributed to human activity: more than burning natural gas and not far behind the use of coal.

Deforestation unleashes a vicious cycle that dries soils, accelerates erosion, contaminates air and water, and disrupts biodiversity.



Source: IPCC; US Department of Energy

Money doesn't grow on trees

A tree left standing has no economic value, but once the tree is cut down, it can be sold for firewood or timber. Faced with this dilemma, over one hundred and fifty world leaders signed the Kyoto Protocol's Clean Development Mechanism (CDM).

The CDM allows industrialized nations to receive credits towards greenhouse-gas reduction targets in exchange for sponsoring emissions-lowering projects in developing countries. So far, however, the CDM credits only reforestation projects not existing forests and has garnered little attention. But there is still hope. Perhaps, when the current treaty expires in 2012, the CDM can be modified to include incentives to protect existing forests from going the way of so many others around the world—in smoke.



Renewable Energy

A developing country needs plenty of energy to grow and Guatemala is no exception. The country consumes roughly 1,400 megawatts per year, a demand that is growing at an annual rate of close to 8 percent. Fortunately, one way Guatemala can meet this increased demand is through clean, renewable hydroelectric and geothermal power.

Liquid power

Guatemala already generates more than 43 percent of its energy from hydroelectric power, derived from roughly eleven private and nine state-owned hydroelectric plants. This figure, however, represents only 13 percent of the country's potential capacity.

A natural way to increase energy capacity is to expand the use of small hydroelectric power plants in coffee growing areas. In these regions, shade protects water systems from evaporating, providing plenty of water for generating electricity. Their minimum impact installations utilize existing water flows rather than dams to supply energy to coffee mills and neighboring communities. Already, twenty-four farms in San Marcos, Alta and Baja Verapaz, and Suchitepéquez generate 42 megawatts per year. More importantly, the hydroelectric capacity of the entire coffee region could contribute over 550 megawatts towards meeting the country's needs.

Photo courtesy of Ram Tzul PNR



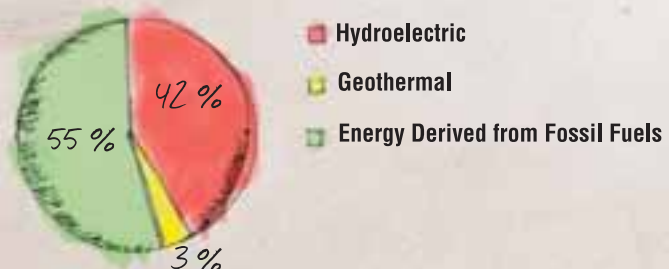
Cascading water at Ram Tzul PNR in Baja Verapaz.

Down to the core

Witnessing a volcanic eruption is proof enough that the center of the earth contains great amounts of heat. But getting to the center of the earth is no small feat. Fortunately, there are several places in Guatemala where heat is transferred from the earth's core to rocks and water on the earth's upper crust where it becomes usable steam to move turbines and generate electricity. Guatemala has the capacity to generate 1,000 megawatts a year from geothermal sources, but currently only produces 2.7% of this potential.

Guatemala's Energy Usage

Source: INDE October 2006

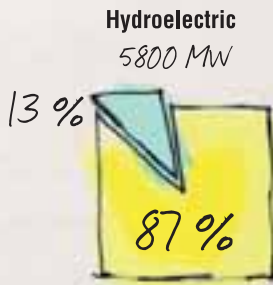
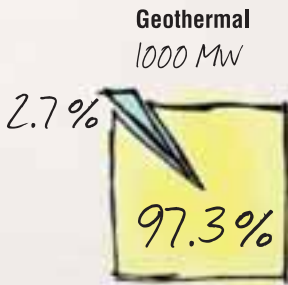


Energy Resources



Alternative Energy Potential

Source: INDE October 2007



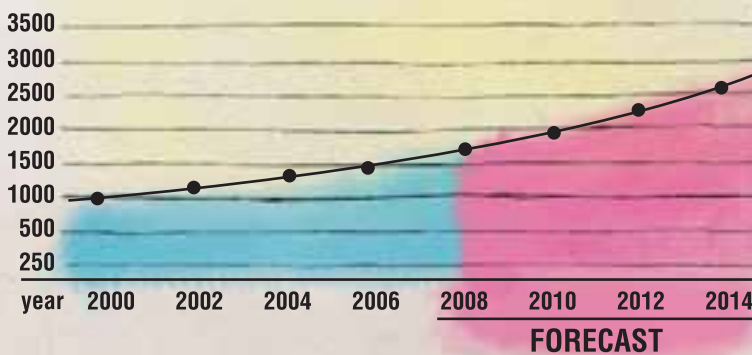
Currently Used
Potential

According to the Guatemala National Institute for Electrical Development (INDE), the country currently has the capacity to generate up to 1,706 MW.

Electricity Consumption 2000-2014

Source: INDE October 2006

Megawatts/hour



Coffee with a Twist

Seen one coffee farm, you've seen them all? Not here. At these farms you not only learn about coffee, you can also ride a zip-line 100 feet above the ground, take a nighttime walk to hear the Northern Potoo (*Nyctibius jamaicensis*) as it hunts, or explore an ancient Maya temple.

Tak'alik Ab'aj

Place of standing stones

At first glance, the five coffee farms near the village of El Asintal appear to be like many others. But these are no ordinary farms; they are home to one of the oldest Pre-classic cities in Mesoamerica, Tak'alik Ab'aj.

The abandoned city of Tak'alik Ab'aj was overrun with vegetation when coffee farmers began cultivating the area in the middle of the nineteenth century. It was several years later, in 1888, that German botanist Gustavo L. Bruhl noticed some interesting pieces of carved stone. The area was mapped, revealing a terraced city extending more than two square miles with a dozen plazas and over two hundred monuments representing more than a thousand years of Olmec and Maya history.



Between the eighth century B.C. and the second century A.D., Tak'alik Ab'aj flourished, trading its prized cacao and salt for valuable jade and obsidian with sites as far away as present-day Mexico and El Salvador. During this period, the Maya built astronomically-aligned monuments of stone and clay, complex canals to prevent flooding, steam baths with subterranean heating, and carved altars rich in symbolism including representations of jaguars, serpents, and owls.

Today, part of Tak'alik Ab'aj is a national archaeological park, while other sectors remain coffee farms. Ongoing excavations have revealed a multitude of artifacts and treasures. Most recently, the tomb of an early ruler was uncovered with his burial possessions intact.



- The 1902 eruption of the Santa Maria volcano buried the ruins of Tak'alik Ab'aj under a dense layer of ash.
- Tak'alik Ab'aj means "standing stones" in K'iche'. The site's ancient name remains unknown.

A Traveler's Eden

Guatemala is a beauty concentrate, jam-packed with color, life, and culture.

Where nature's architecture rivals man's.

This treasure map shows Guatemala's archaeological gems; natural beauties in the form of caves, rivers, and volcanoes; and multiple destinations for sport and culture. Not to be missed—coffee tours that blend history, culture, and nature into one amazing destination.



- River
- Lake
- 4-Lane Highway
- Central American Highway
- National Road
- Port
- Town

- Coffee Tour
- Bird Watching
- Volcano
- Active Volcano
- Cave
- Archaeological Site
- Water Attraction
- River Rafting
 - Class II - III
 - Class III+
 - Class III - IV
- Surfing
- Sailfishing



Source: Anacafé / INGUAT
Bird Watching Round Table / INSIVUMEH



Photo by José Yee

Long-beaked Cinnamon Hummingbird

Bird beauties of the lake

It is hard to imagine that there is as much breathtaking beauty behind Lake Atitlán as there is along its shores. Los Tarrales Private Nature Reserve and coffee farm, located on the southern slope of the Atitlán volcano, is undoubtedly one of the best spots for bird watching, especially to catch a glimpse of the endangered Horned Guan (*Oreophasis derbianus*).

Here is also the chance to see species found only on Guatemala's southern coast: the Long-tailed Manakin (*Chiroxiphia linearis*), Cinnamon Hummingbird (*Amazilia beryllina*), Berylline Hummingbird (*Amazilia beryllina*), Pacific Parakeet (*Aratinga strenua*), and the very rare Azure-rumped Tanager (*Tangara cabanisi*).

Not to be missed are the nature walks through miles of shaded coffee plantations and the Eden of exotic flowers with over one hundred fifty varieties of heliconias, anthuriums, palms, gingers, bromeliads, and more.

Keepers of the forest

In the cloud forests of Cobán live the Q'eqchi' Maya, proud coffee growers for more than a century. In 1984, the Q'eqchi' of this region came together to grow coffee as a cooperative under the name Chicoj. Starting with just sixty bags of parchment coffee, Chicoj has grown to include over three hundred members and produce more than four thousand bags of SHB coffee.

A visit to Chicoj brings one in contact with the Q'eqchi' way of life and their knowledge of coffee cultivation. As visitors walk along winding paths they get a close look at coffee plants and milling practices. The Q'eqchi' are also caretakers of a 300-hectare forest of cedar and liquidambar trees and countless species of mosses and ferns unique to this region.

For a bird's-eye view of the area's coffee plants and crystal clear lagoon, visitors can soar across three different sets of zip-lines, and then enjoy a well-balanced cup of Chicoj's coffee.



Zippering across coffee fields at the Chicoj cooperative, one of three small-producer Coffee Tours supported by Anacafé.

From the highest mountain

In the late nineteenth century the Montes family, looking for a good place to build their farm house, picked the highest spot on the property. Unbeknown to them, on that very spot, perfectly aligned with the Tolimán volcano 60 kilometers away, lay the ruins of a thousand-year-old Maya temple.

It is believed that the Montes farm, Buenos Aires, is located on what was once the residential area for Tak'alik Ab'aj's nobility. Remnants of their occupation can still be seen throughout the farm's orchid-filled garden and coffee-covered fields. In 1992, a burial containing two important jade masks was uncovered at this archaeological site.

But its ancient history is only one of the elements which make Buenos Aires so special. There are also its enormous Cedar (*Cedrela odorata L.*) and Guayabo (*Psidium guajava*) trees, ten natural springs, and a picture-perfect plant nursery. Many of the farm's indigenous residents and workers wear beautifully woven crimson *huipiles*. Here, on this extraordinary land, the sixth generation of the Montes family grows Rainforest Alliance certified coffee within a Private Nature Reserve.



Photo courtesy of Buenos Aires PNR

Ceremonial jade mask unearthed at Buenos Aires PNR.



*The innovative owner of Buenos Aires, Felipe Guzmán, breeds a small bee species with an elegant name, *Cephalonomia stepandores*, a natural predator of the coffee pest broca.*



A Positively Green Future

For several decades the argument has raged about how to best preserve the world's resources and biodiversity. This endless tug of war has placed those who work the land in direct opposition with those who feel it is being threatened. But as scientific research has proven, agroforestry systems, like shaded coffee, can bring about a compromise that combines the goals of sustainable agriculture with environmental protection.

Shaded coffee reduces deforestation, increases habitats for native and migratory species, and provides a benign ecosystem between areas of primary forest. But for these benefits to continue, farmers need to generate a competitive income from coffee that will ensure they do not switch to other higher priced, but environmentally damaging, agricultural products.

In developing countries environmental concerns often lag behind issues of human welfare. Yet innovative strategies and incentives can turn farm owners and

communities into the primary protectors of forests. First, by defining the ecological services fulfilled by the coffee forest and then by making these services productive.

A good example is the hydroelectric capacity of farms. Farm owners and communities will be more likely to protect water resources if they can be utilized to generate income. The same principle can be applied to biodiversity protection. Steps may be taken to protect a bird species if it is understood to be endangered, and if the costs incurred can be partially met by paying visitors. The possibilities for combining environmental preservation with economic sustainability are virtually endless.

As Guatemalan coffee enters its third century it faces a unique opportunity to shape the country's environmental future to a great extent. To do so, new income-generating strategies that encourage conservation need to be developed while quality coffees continue to be produced. Given the model provided by agroforestry the future looks positively green for coffee and nature.



Agroforestry is defined as a dynamic, ecologically based natural resource management practice, which through the integration of trees in the agricultural landscape diversifies production for increased social, economic, and environmental services.

Meant to Be Green

When Mexican Nahuatl tribes arrived in Guatemala in the twelfth century, they aptly named it Guauhitemala or "land of forests" for the vast green lands they found. And green it still is, with vast tropical forest preserves, innovative Private Nature Reserves, and shaded coffee fields that extend for many a green mile.



- Biosphere
- Biotope
- Park
- Refuge
- National Reserve
- Private Nature Reserve
- Other Protected Areas
- Coffee Growing Area
- PINFOR

PINFOR, the Forestry Incentive Program, established in 1997 by the Guatemala's National Forests Institute (INAB), provides financial support for reforestation and forest management. To date, the project covers near 210,500 hectares throughout the country.



Photo courtesy of Los Andes PNIR

A common sight in humid forests, this bright-yellow orchid highlights Guatemala's beauty.



Source: Anacafé / CONAP / INAB



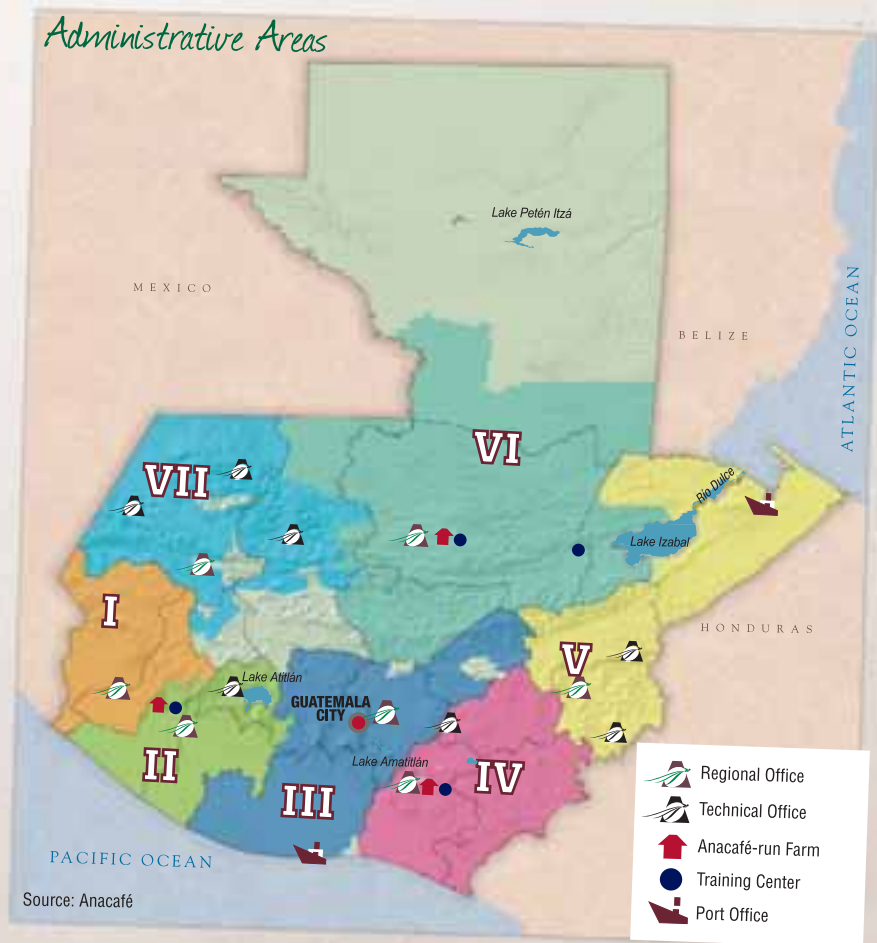
Anacafé's headquarters in Guatemala City, built in 1993.

The Guatemalan National Coffee Association (Anacafé) is a dynamic organization founded in 1960 representing more than seventy-five thousand coffee producers. It employs approximately two hundred and fifty people in Guatemala City and across seven regional offices, including field and lab technicians, cuppers, educators, and marketing personnel.

Anacafé provides its members with scientific research and technical support for coffee production and processing, market data and analysis, laboratory testing, and educational training in sustainable practices and coffee preparation.

Branch service

Wherever coffee is grown in Guatemala, Anacafé has a regional office available to provide technical and administrative support to interested coffee farmers and to conduct region-specific research.





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Guatemalan Coffees Green Book produced by:
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