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“Vital for war production, military operations, and sustaining the civilian standard of living, rubber was the nation’s most valuable agricultural import. The United States consumed about 60 percent of the world’s rubber, some six hundred thousand tons each year, yet it produced virtually none. About 97 percent of the nation’s supply came from lands in Southeast Asia that had fallen to Japan after Pearl Harbor.”
— Mark Finlay, *Growing American Rubber*

A severe shortage of rubber presented one of the most serious challenges to American fighting capability during World War II. Rubber is essential for vehicle tires, belts, hoses, gaskets, boots, raincoats, aviator seat cushions, bullet-resistant fuel tanks, gas masks, and life rafts. Americans everywhere sacrificed their private convenience for victory. A team of Japanese American scientists at Manzanar made a valuable contribution toward a solution of the rubber crisis, and a plant unknown to most people today hit the national limelight.

Stretching Resources

A Lot of Rubber

Sherman tanks	25,000 tons
Heavy bombers	30,000 tons
Soldiers’ shoes	45 million pairs
Airplane tires	over 4 million

Did you know?

The primary reason for gasoline rationing in the United States during World War II was to conserve rubber.

The Rubber Tree

The most important natural source of rubber is *Hevea brasiliensis*, native to the Amazon rainforest. In the late 1800s, British and Dutch colonists developed rubber plantations in Southeast Asia which by the start of World War II provided most of the world’s supply.

In December 1941, Japan struck southward at British and Dutch possessions in Southeast Asia, securing natural resources for its war against China, including petroleum, tin, and rubber.

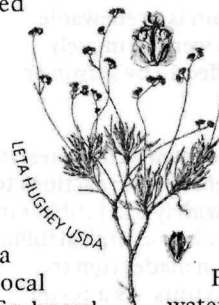
America needs your SCRAP RUBBER

WAR PRODUCTION BOARD

New Materials for New Tires

In 1942, Congress funded scientific research and development at an unprecedented level. A small Southwestern desert shrub called *Parthenium argentatum*, or guayule, showed the most promise, and

Congress authorized the Emergency Rubber Project (ERP), in March 1942. The ERP employed thousands of scientists, and tens of thousands of laborers across the nation, with its guayule operation based in Salinas, California.



Guayule Pros and Cons

Promoters insisted the U.S. needed a renewable and domestic source of rubber that would be free of fluctuations in supply and price due to geopolitical instability. They also believed a domestic rubber industry would profit local economies, advance American scientific knowledge, and provide a safety cushion in times of need.

Critics argued that guayule was not cost effective without a heavy federal subsidy. Once the war ended, it would be even less profitable, and local economies invested in guayule would suffer. Furthermore, guayule would waste land and water better used for raising food, and synthetic rubber from petroleum would be a cheaper domestic source.

Serving a Nation in Need

At the same time the ERP was starting, Japanese Americans were exiled from their West Coast communities to isolated "War Relocation Centers." A number of highly skilled chemists, biologists, and engineers were incarcerated at Manzanar. Plant physiologist and California Institute of Technology professor Robert Emerson had worked with many of them, and proposed creating a research team at Manzanar to offer these scientists the opportunity to contribute to the war effort.

The Manzanar Guayule Project eventually included a lath house with propagating beds south of Block 6, a chemical laboratory in the Block 6 ironing room, a breeding laboratory in the Block 35 ironing room, a cytogenetics laboratory in the hospital, field plots at numerous locations around the camp, and even three greyhounds from Los Angeles dog tracks to deal with local rabbits.

Work began in the spring of 1942 with waste cuttings from the ERP in Salinas, and eventually expanded to some 200,000 plants at Manzanar, plus 50,000 more at the camp in Poston, Arizona.

They will have contributed toward the building of good will between the Japanese in America and their Caucasian friends and fellow citizens. Such good will is sure to extend beyond the particular individuals who are fortunate enough to be working on the guayule project. It will benefit the entire Japanese community.

—Dr. Robert Emerson
Manzanar Free Press, August 10, 1942

Against the Odds

The Manzanar team achieved unexpected successes, on a shoestring budget, growing guayule from waste cuttings. Additionally, they hybridized plants to tolerate Manzanar's extreme temperatures, milled them to minimize fiber content, and ultimately produced a rubber superior in tensile strength to that made in Salinas, and even superior to tree rubber.



Manzanar Guayule Project Team

Guayule Today

In the end, synthetics won the day. Petroleum-based synthetics made slow progress at first, so rubber from grain-based alcohol satisfied 77% of the rubber supply in 1943, 63% in 1944, and 39% in 1945. While grain is a renewable resource, petroleum prices were ultimately lower, more stable, and unaffected by season or crop yield.

In recent years, there has been renewed interest in guayule. Some people suffer allergic reactions to Hevea latex, still the most widely used rubber in the world. For them, rubber gloves, surgical tubing, catheters, and contraception made from tree rubber is potentially dangerous. As a result, guayule has much promise in the medical field.

Guayule also has potential as a biofuel. Unlike oil, guayule is renewable, and unlike ethanol from corn, guayule fuel is not a food source, but a byproduct of rubber production.

The guayule bushes at the entrance to the Manzanar National Historic Site Visitor Center were cultivated from original Manzanar seed and planted by Frank Kageyama beginning in 2004. They serve as a reminder of the proud achievements and dedicated service of transplanted Americans who served their country honorably in the face of prejudice, and the success of scientific collaboration without discrimination because of race, creed, color, or national origin.