

**Discovery and Analysis of Petrified  
Wood in the San Jacinto River**

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## **Discovery and Analysis of Petrified Wood in the San Jacinto River**

### **Abstract**

The purpose of the project was to analyze petrified wood discovered in the San Jacinto River for wood type, mineralization type, density, and presence of iron. It was hypothesized that most of the petrified wood would be palmwood, which is the state stone of Texas. The petrified wood was polished on one end using grinders in order to identify the wood type. The petrified wood was weighed and the volume was determined so as to calculate the density. The color was recorded and a fluorescent light was shown on the wood to determine the type of minerals that caused the wood to be fossilized. The petrified wood was heated so as to show the iron. One hundred and thirteen pieces of petrified wood were collected and weighed 12.5 kg. This petrified wood was from the Pleistocene to Eocene periods, making it 3 to 40 million years old. Hardwood was 76%, softwood was 11% and unknown wood was 13%. There was no palmwood. The average density was about 2.5 g/ml, but there was no difference between the density of petrified wood and river rocks. The major colors of the petrified wood were black, brown, orange, gray and white, meaning that most of the petrified wood was mineralized with manganese, carbon, iron, and silicon dioxide. There was much more brown in the hardwood than in the others, meaning the presence of iron. Sixty-six percent of the petrified softwood was fluorescent, and 28% of the hardwood was fluorescent. Heating of the petrified wood brought out more red color, which revealed iron. Petrified wood had not been previously reported to be in the San Jacinto River, and so this was a new paleobotany discovery. The petrified wood was mostly hardwood, but not palmwood, and was about 3 to 40 millions years old.

## **Introduction**

The purpose of the study was to determine what kinds of petrified wood were in the San Jacinto River. Petrified wood was first seen while kayaking down the San Jacinto River. Along the side of the river and on patches of land that stuck out of the river, unusual looking rocks were seen. Upon closer examination, these rocks looked like wood, but were as heavy as stone. Thousands of pieces of petrified wood were found on the sand bars in the river. Numerous pieces of petrified wood were shown to a paleobotanist, who confirmed that they were petrified wood. The size of the wood varied, some of them being a half an inch while others were up to 7 inches long. The colors varied too; most were black and brown, but some were chalky white, red, and multicolored.

It was easy to tell petrified wood from real wood. Petrified wood looked just like wood, but it was hard and heavy like a rock. Color can be used to find out what kind of mineral was responsible for petrifying the wood. Identifying the type of petrified wood can be difficult, and depends on how well the wood was petrified. The wood being buried in mud, sand, or volcanic ash started the process of petrification. Then, water seeped through the mud and sand into the buried logs. There, it filled the empty cells of the decaying wood with this matter until the structure had become solid stone. This stone showed many details of the original wood structure, especially under the microscope.

There are two types of trees: gymnosperms, which are also called conifers or softwoods (fir, pine, redwood, spruce, and cedar) and angiosperms, which are also called hardwoods (oak, sycamore, walnut, maple, palm, and willow). Identification is dependent upon tracheids, vessels, parenchyma, rays, and resin duct pattern being intact.

All wood has tracheids, but they are in different patterns. Tracheids are like tubes that run the length of the tree to carry water and nutrients. The size and pattern of the tracheids can be used to identify specific trees. Further features are also used to help identify the tree type. For example, pine trees have resin ducts. Conifers have very narrow rays, which are white lines in between the tracheids. Sycamores have rays that flare out.

Finding large amounts of the petrified pieces implies that there was a “petrified forest” near the San Jacinto River. Investigation of this petrified wood showed the kinds of trees there were living in this area thousands or millions of years ago. Based on background research of this subject, petrified wood has not previously been reported in the San Jacinto River. It was very exciting to discover something that no one has discovered before. Because the state stone of Texas is palmwood, it was hypothesized that most of the petrified wood would be palmwood.

### **Materials and Methods**

Materials: The main materials needed were petrified wood collected from the San Jacinto River. The equipment to polish the petrified wood was grinders with different grits (100, 120, 140, 220, 600, 1200, and 12000/diamond polisher), and a polishing wheel. A 20X jeweler’s loupe (Hastings/Bausch and Lomb) was used to observe the patterns of tracheids, vessels, parenchyma, rays, and resin ducts in the petrified wood. A volumetric flask and scale was used to measure density. A long ultraviolet light (Ultraviolet Products Inc., San Gabriel, CA) was used to measure fluorescence. Reference books on petrified woods were used to identify the types of wood, if possible.

Procedure: Petrified wood was collected from the San Jacinto River. This was best done when the water was low, because it exposed the river bars where the wood was deposited. The petrified wood was first cleaned with water and soap. The petrified wood was then polished using sanders with different coarseness beginning with the most coarse and increasing to a finer grain of sander for polishing. The final step was to buff the wood on a polishing wheel using cesium oxide. Each piece of petrified wood took approximately 20-30 minutes to polish. The polishing steps were performed in the workshop of the Houston Gem and Mineral Society (10805 Brooklet Street, Houston, TX 77099).

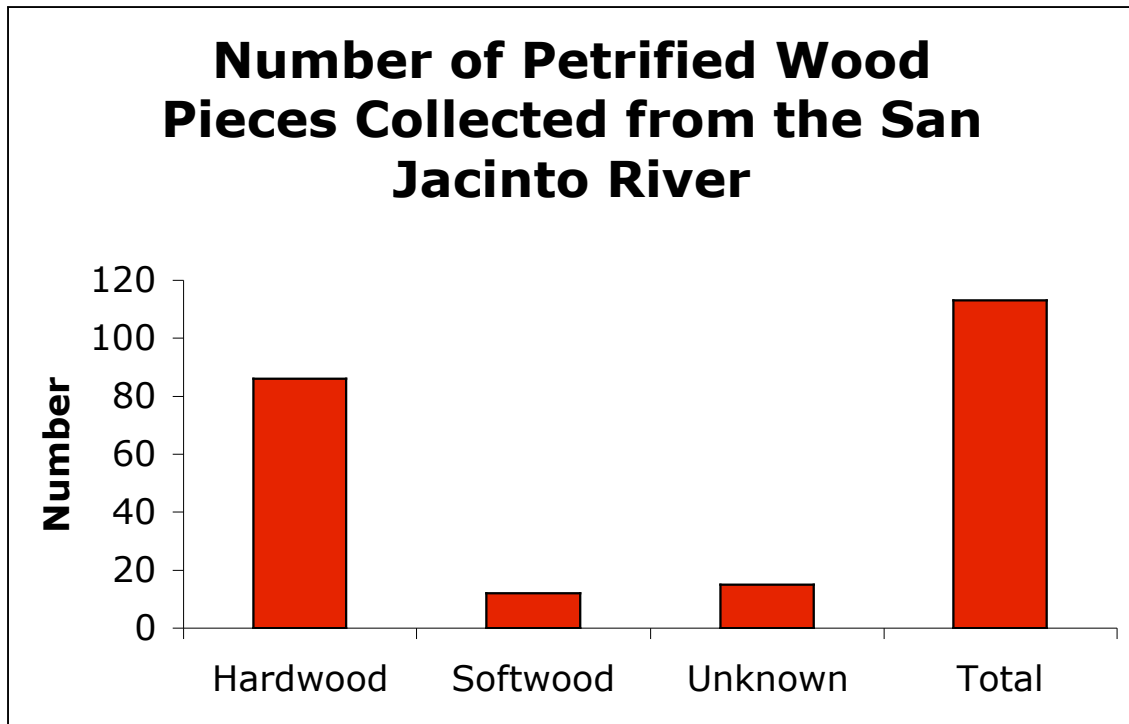
After polishing the wood, the type of wood, type of mineralization, and density of the wood were determined. The type of wood was determined using a jeweler's loupe to magnify the wood so that it could be identified. The pattern of the petrified wood was compared to the pictures of petrified wood in the reference materials. The type of mineralization was determined from the color of the wood, which was seen best after polishing. The color showed the type of minerals that were deposited during the petrification process. A reference book on petrified wood colors was used to identify the minerals. The density was determined by placing the petrified wood in a volumetric flask and by measuring the water displacement. The petrified wood was weighed. Density in grams per milliliter was calculated. This was compared to river rocks. Fluorescence was determined by shining a long ultraviolet light on each piece of wood or rock. Some petrified wood was heated at 400 degrees F to determine if heating would turn the petrified wood red, meaning that iron was in the petrified wood. All of the data was graphed.

## **Results**

### **Petrified wood pieces were collected and polished for analysis**

One hundred and thirteen pieces of wood were collected randomly from the San Jacinto River. These were polished in the workshop of the Houston Gem and Mineral Society (HGMS). It took an average of 15 minutes to polish one end of each piece of petrified wood, so it took 28.25 hours to polish all of the petrified wood. The type of wood was identified with the help of the paleobotanist at the HGMS, by examining the polished end using a jeweler's loupe (20X). It was found that the petrified wood still had the vessels, tracheids and rays so that the wood could be classified. Most of the petrified wood was hardwood. See Graph 1. There were 86 pieces of hardwood, 12 pieces of softwood and 15 pieces that could not be identified (unknown). The type of tree (genus and species) could usually not be identified. A few pieces were identified as walnut, laurel, juniper and osage-orange. Osage-orange has not been found previously as petrified wood in this area. None of the petrified wood found was palmwood. The petrified wood came in all colors and shapes. Some of the pieces had rounded edges, which showed that the water had been running over them for a long time in the river. The petrified wood came in all sizes. The largest pieces were about 6 inches long and 4 inches wide. A lot of the petrified wood looked like tree limbs because there was petrified bark around the entire outside. No petrified whole tree trunks were found. When there was a flood in November, there was a lot of new petrified wood in the river. This shows that there was still a lot more petrified wood being washed into the river, but the exact source is unknown.

Graph 1



**Weight of petrified wood**

The weight of all of the wood was measured on a scale in pounds and then converted to grams. See Table 1.

<b>Table 1 – Weights of Collected Petrified Wood</b>			
	<b>Hardwood</b>	<b>Softwood</b>	<b>Unknown</b>
<b>Pounds</b>	20	3	4.5
<b>Grams</b>	9091	1364	2045

**Classification of types of petrified wood**

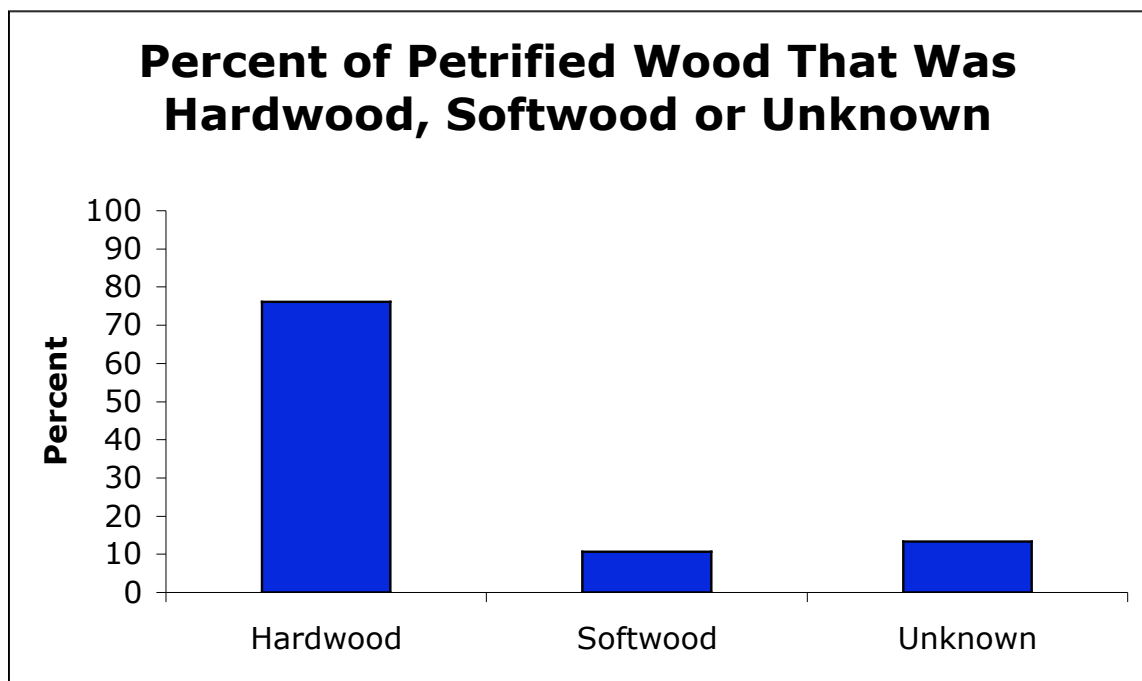
The type of wood (hardwood versus softwood) was determined using a jeweler’s loupe. Hardwoods, also known as angiosperms, can be maple, oak, elm, walnut, osage-

orange, ash, or palm. Softwoods, also known as gymnosperms, can be pine, juniper, cedar, or spruce. See Graph 2.

Most of the wood in this area was now pine (softwood). Since most of the petrified wood was hardwood, this suggests that the ancient forest was a lot different from the forest today.

Based on the Geological Highway Map of Texas (United States Geological Service), this petrified wood was from the Pleistocene to Eocene periods, making it 3 to 40 million years old.

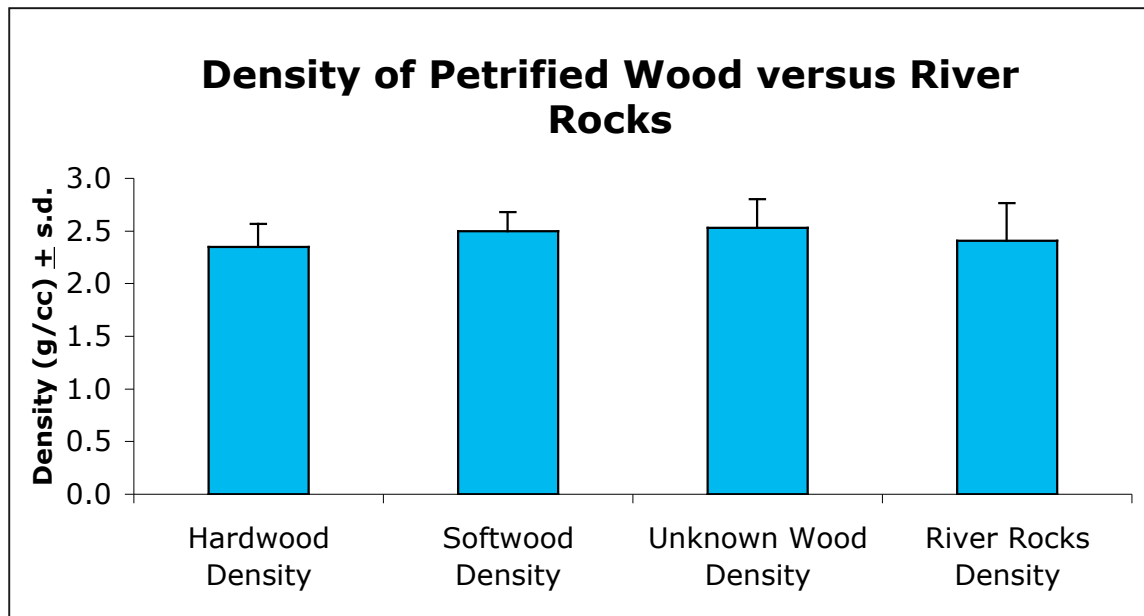
**Graph 2**



### **Density of types of petrified wood and river rocks**

Thirty hardwoods, 10 softwoods, 13 unknowns, and 30 river rocks were used in the measurement of density. The mean and standard deviation were calculated. There were no differences in density. See Graph 3.

Graph 3

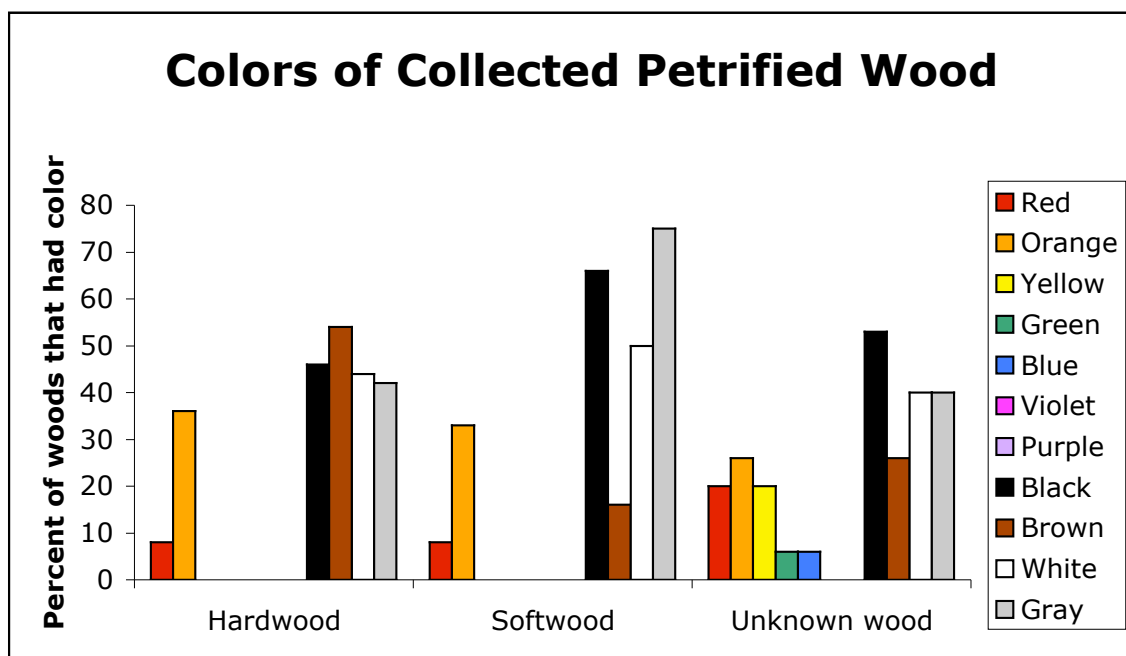


### Petrified wood colors

Some pieces were all black and some were all white. Most pieces had a mixture of colors, sometimes in streaks. Most pieces were brown, gray and black. The color of petrified wood indicates the type of minerals that replaced the wood structure. Table 2 was taken from Daniels (1998) and can be used to interpret the colors of petrified wood that was collected from the San Jacinto River. Most of the minerals in the petrified wood were iron, manganese, carbon, and silicon dioxide. See Graph 4.

<b>Table 2 – Colors Found in Petrified Wood and Some Corresponding Minerals</b>	
Red	Iron
Orange	Iron
Yellow	Iron, uranium
Green	Iron, copper, cobalt, chromium, uranium, nickel
Blue	Copper, manganese, cobalt, chromium
Violet	Manganese, iron
Purple	Iron, manganese
Brown	Iron, uranium
Black	Manganese, carbon, iron
White	Silicon dioxide
Gray	Silicon dioxide

**Graph 4**

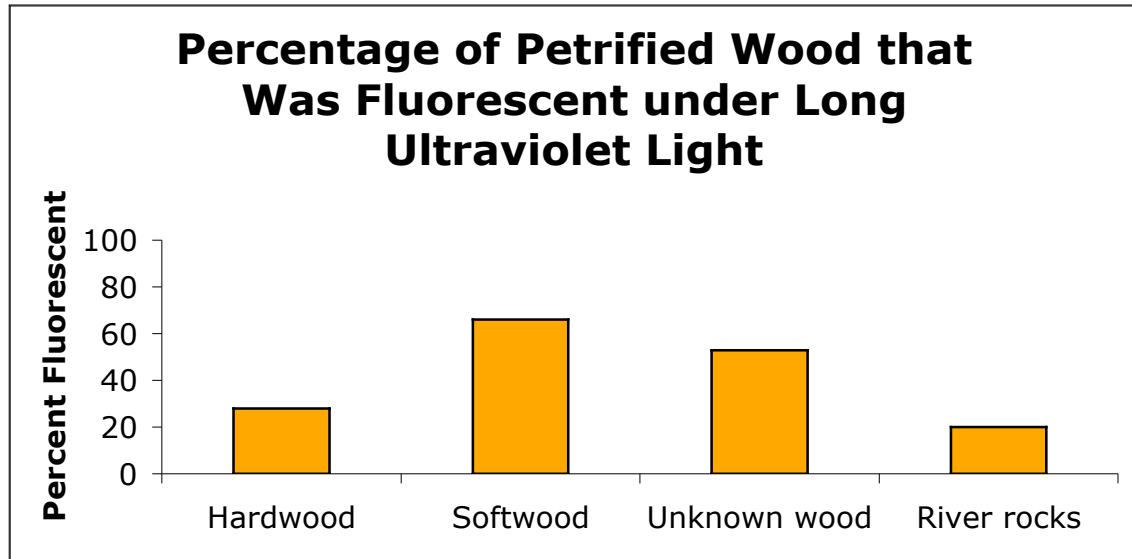


**Fluorescence of petrified wood under long ultraviolet light**

Fluorescence can indicate the type of minerals that are in the petrified wood. In the petrified wood that was collected, fluorescent white and blue were in small pinpoints. Fluorescent green and yellow were in small patches. Fluorescent orange was in big patches, sometimes on the entire outside of the wood. See Graph 5. The types of

minerals shown by the fluorescence agreed with the types of minerals that were shown by the colors in Table 2 and Graph 4. Much more softwood was fluorescent than hardwood.

**Graph 5**



### **Effect of heating on the color of the petrified wood**

Three out of the 7 pieces turned red after being heated for 2 hours. This means that there was iron in the petrified wood.

### **Conclusions**

Petrified wood was found in the bottom of the San Jacinto River. Most of the petrified wood was hardwood. The petrified wood came in all different colors showing that a lot of different minerals went into the wood when it was being petrified. Most of the pieces were small and looked like tree limbs. There were no large tree trunks. There was no difference in the density of the petrified wood and river stones. There was a lot more hardwood than softwood. This shows that the forest of millions of years ago was a

lot different than the forest around the river today. It was expected that a lot of the petrified wood would be palmwood, but the hypothesis was proven to be wrong. Petrified palmwood was supposed to be common in Texas and was the state stone. This says that there were not any palm trees in this area when the wood in the river was buried and then petrified.

One thing that was not done was to find the source of the wood. It was possible that somewhere along or in the San Jacinto River there was a buried petrified forest. It was harder to identify the type of wood than expected. Even the paleobotanist could not identify the wood type because a lot of the wood was tropical wood that does not grow around here any longer or was extinct. No one has shown before that there was petrified wood in the San Jacinto River. This was a new paleobotany discovery.

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