

The Hickory Sandstone, South-Central Texas



Goals of the project

The research question for the Hickory Sandstone project is just like that for the Jackfork Group project: “how were the rocks of the Hickory Sandstone deposited and in what type of environment(s) were they originally formed?” The difference is in the data you will collect, analyze and interpret to answer this question. This project is designed to give you experience with fluid flow and development of sedimentary structures, marginal marine and continental depositional environments, and field observations and interpretation of field data, as well as practicing skills learned during the Jackfork project. Our focus for the Hickory project will be on characterizing lithology in hand sample and thin section, grain size analysis, bedding style (from field observations), and analysis of sedimentary structures.

How will you attack the problem?

Over the next month you will work in and out of class to address the material you’ll need to know to interpret these rocks. You will spend some time describing the different lithologies in the Hickory Sandstone, paying particular attention to changes up-section, diagenetic alteration, and grain size. During our day-long field trip to representative outcrops of the Hickory Sandstone on February 10, you’ll make detailed observations and measurements on the bedding style and sedimentary structures in these rocks. Finally, you’ll combine your knowledge of sedimentary structure development, fluid flow, and lithology with what you can glean from the (brief) literature available on the Hickory Sandstone to make a defensible interpretation of sedimentary environment(s), based on the data you collect and analyze. As with the Jackfork project, I will assign some specific readings to help address these issues, but you should also delve into your textbook and other sources on your own to answer some of the questions that will certainly arise.

Background

The Late Cambrian Hickory Sandstone is the lowest member of the Riley Formation and unconformably overlies the Precambrian Town Mountain Granite in the Llano Uplift of South-Central Texas (figures 1 and 2). Although its thickness varies greatly, the Hickory reaches 137 m thick in some areas. The basal contact between Hickory and the underlying granite has a local relief of 6 to 12 m, as indicated by surface topography of recently exhumed granite exposed in the uplift area. Locally, the relief on the contact is in excess of 12 m. Several models have been proposed for the details of the depositional environment(s) for the Hickory Sandstone.

For field mapping purposes, the Hickory Sandstone is divided into three units: the lower, middle (further subdivided into two subunits based on core data), and upper Hickory Sandstone (figure 2). Figures 3-6 show representative core samples of each of these units.

Part 1: Lithology and Grain Size Analysis of the Hickory Sandstone

You will see and describe examples of the three Hickory units (including the two middle subunits) in hand sample and thin section. In addition, Figures 3-6 contain representative core photographs of each of these units. You will also collect grain-size data for the Hickory Sandstone and analyze changes and trends using techniques learned during the Jackfork project.

Part 2: Bedding style and sedimentary structures of the Hickory Sandstone

Your interpretations of bedding style and sedimentary structures will be based on data you collect during the day-long field trip. You will take measurements on different structures, note changes and trends up-section (based on the four representative stops), and note any trace fossils, mud-rich units, and evidence of diagenesis that may be useful for your interpretation. I encourage you to take numerous field photos so that you can document these different features.

Part 3: Evolution of depositional environments in the Hickory Sandstone

The depositional environment of the Hickory varies throughout the section, so you will be collecting and analyzing data with an eye toward describing and interpreting these changes. As with the Jackfork project, you should incorporate information from the literature, but be certain that your interpretations are supported by the data you collect.

References

Randolph, L. C., and Johnson, B., 1997, Geology and hydrogeology of the fault-partitioned Hickory Aquifer in northern Mason County, Central Texas: Industrial Associated Program, Center for Tectonophysics, Texas A&M University, research proposal.

Project Deliverables

1. Project Poster to the following specifications, due on CD *and* saved to the GEOS 3422 class folder (but NOT printed) **by 11:30 am, Monday, March 5:**
 - o 36 x 48" poster (3 x 4') following standard conference format (such as that used at GSA)
 - o Font no smaller than 18-point, preferably sans-serif, such as Arial or Helvetica
 - o Poster should be done using Adobe Illustrator and Photoshop programs
 - o The poster should present research results as thoroughly as a written paper would, but using far more figures than text (tell the story with pictures)
 - o Poster sections should include:
 - Title and author
 - Abstract (300 word maximum)
 - Geologic background
 - Observations and data:
 - Lithology description
 - Grain size analysis
 - Stratigraphic measurements
 - Bedding styles
 - Sedimentary structures and bioturbation
 - Additional field observations
 - Interpretation of the observations and data
 - Conclusions: interpretation of the Hickory Sandstone depositional environment(s) based on data collected and interpreted
 - References
2. Oral Poster Presentation during lab time on **Thursday, March 8**
 - Individual poster presentations will take place during lab time; please note that you will *not* present to each other (or any other audience except myself), as that would put the first presenters at a disadvantage relative to later presenters
 - Presentation involves giving a brief summary of your research results and interpretations, followed by further explanation and answering my questions
3. Possible poster presentation in the "Academic Showcase of Student Talent" during Spring Family Weekend on Saturday, March 31 (10-11:30 am in Northrup Hall)
 - I will invite one (or maybe two) presenters to present their poster(s) during the showcase

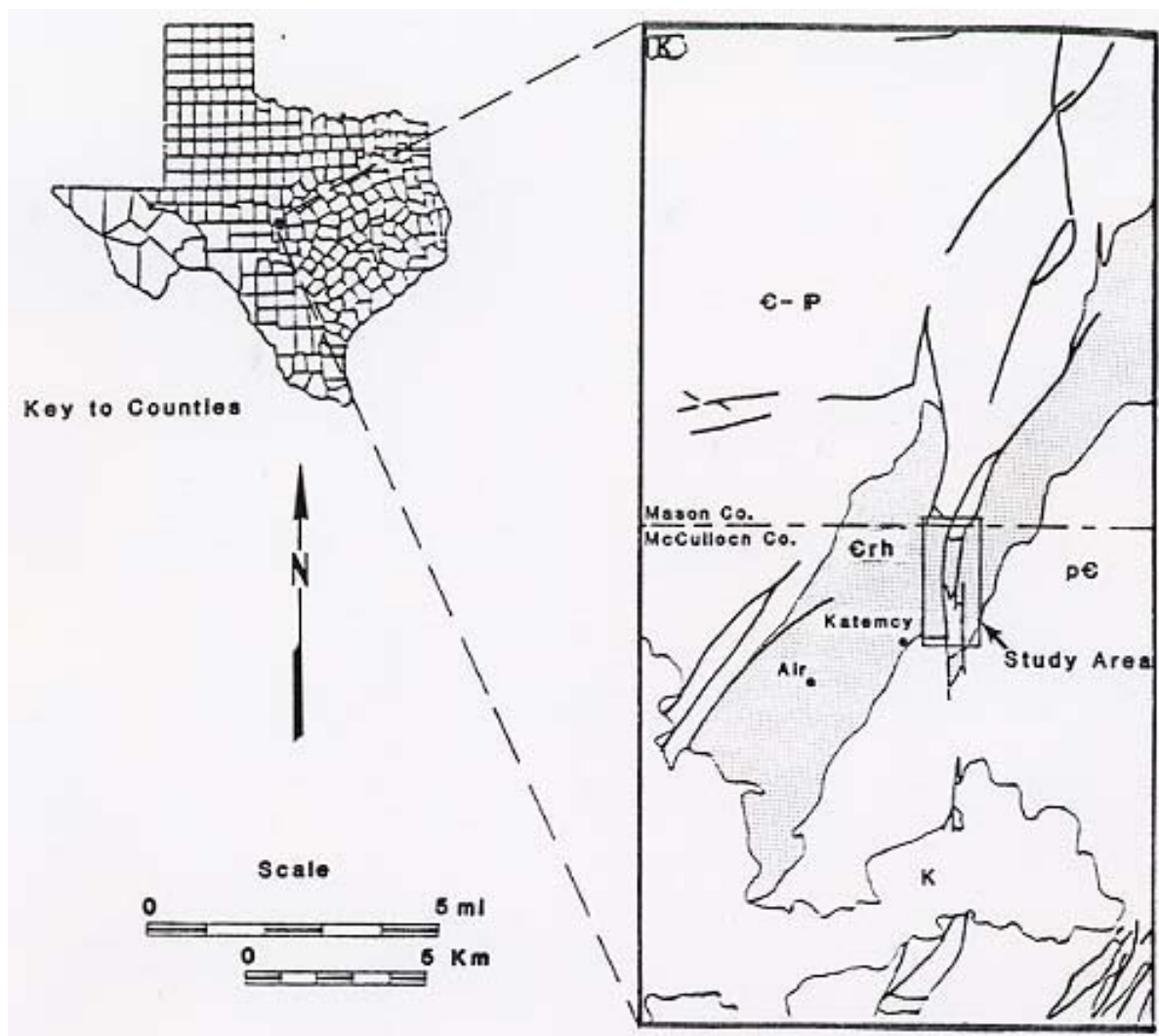


Figure 1: Map showing general outcrop belt of Hickory Sandstone in Mason and McCollough counties (from Randolph and Johnson, 1997; modified from Barnes and Schofield, 1964).

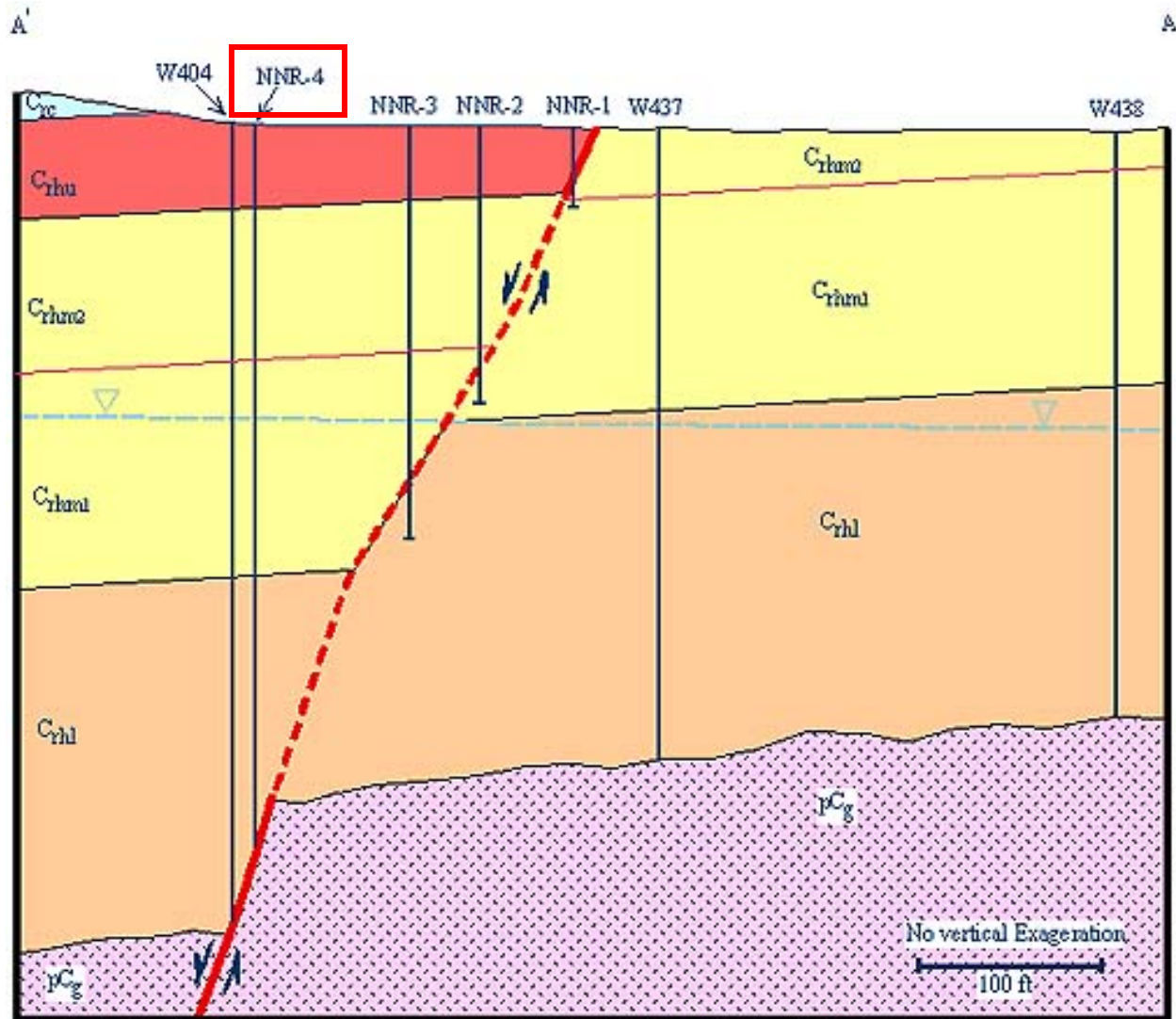


Figure 2: Cross section of the Hickory Sandstone member of the Riley Group in Central Texas, based on core and well data (from Randolph and Johnson, 1997). Core photos in Figures 3-6 are from **Core NNR-4**.

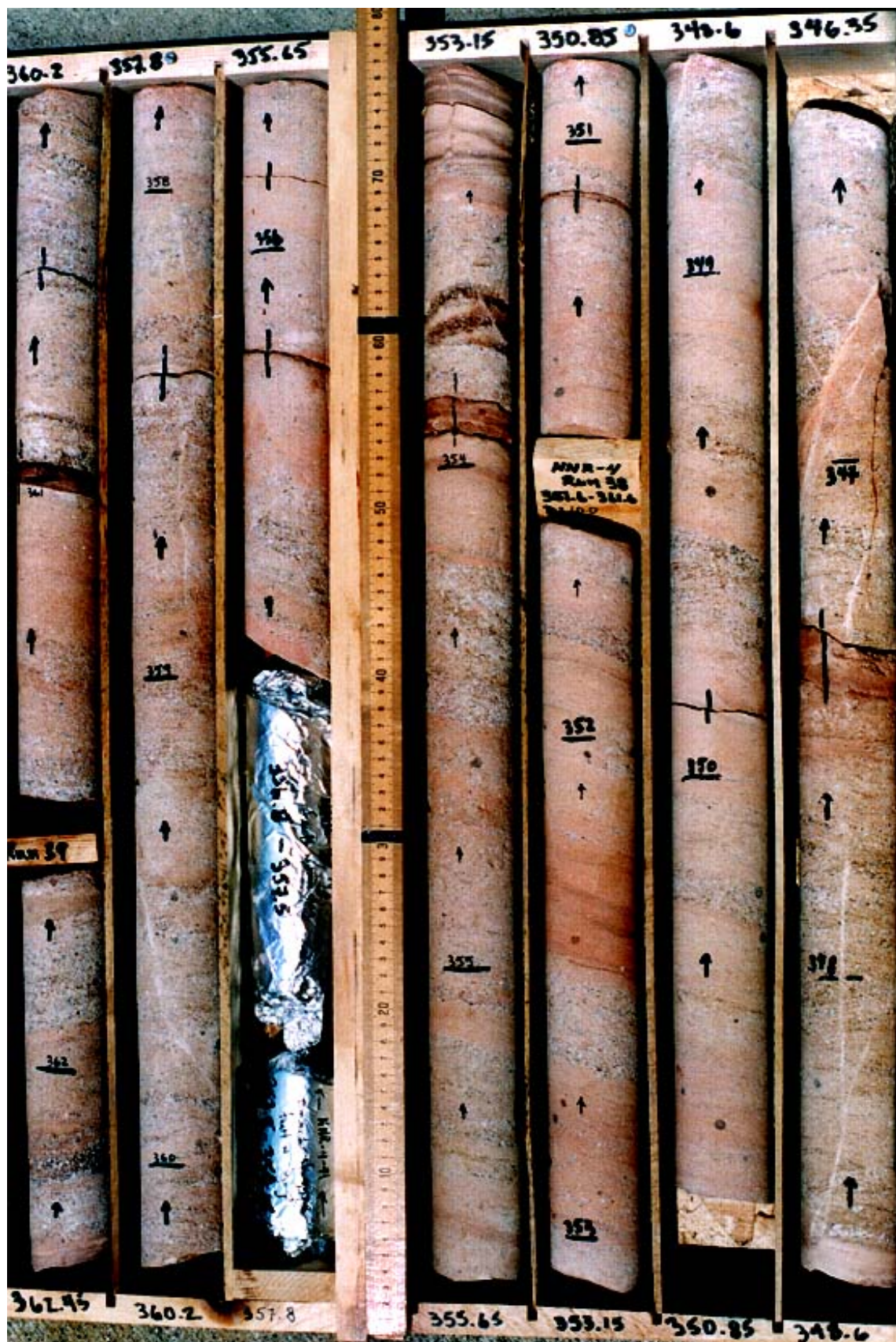


Figure 3: Core photograph from the Lower Hickory Sandstone (250-450' below surface).



Figure 4: Core photograph of the Lower-Middle Hickory (135-250' below surface).

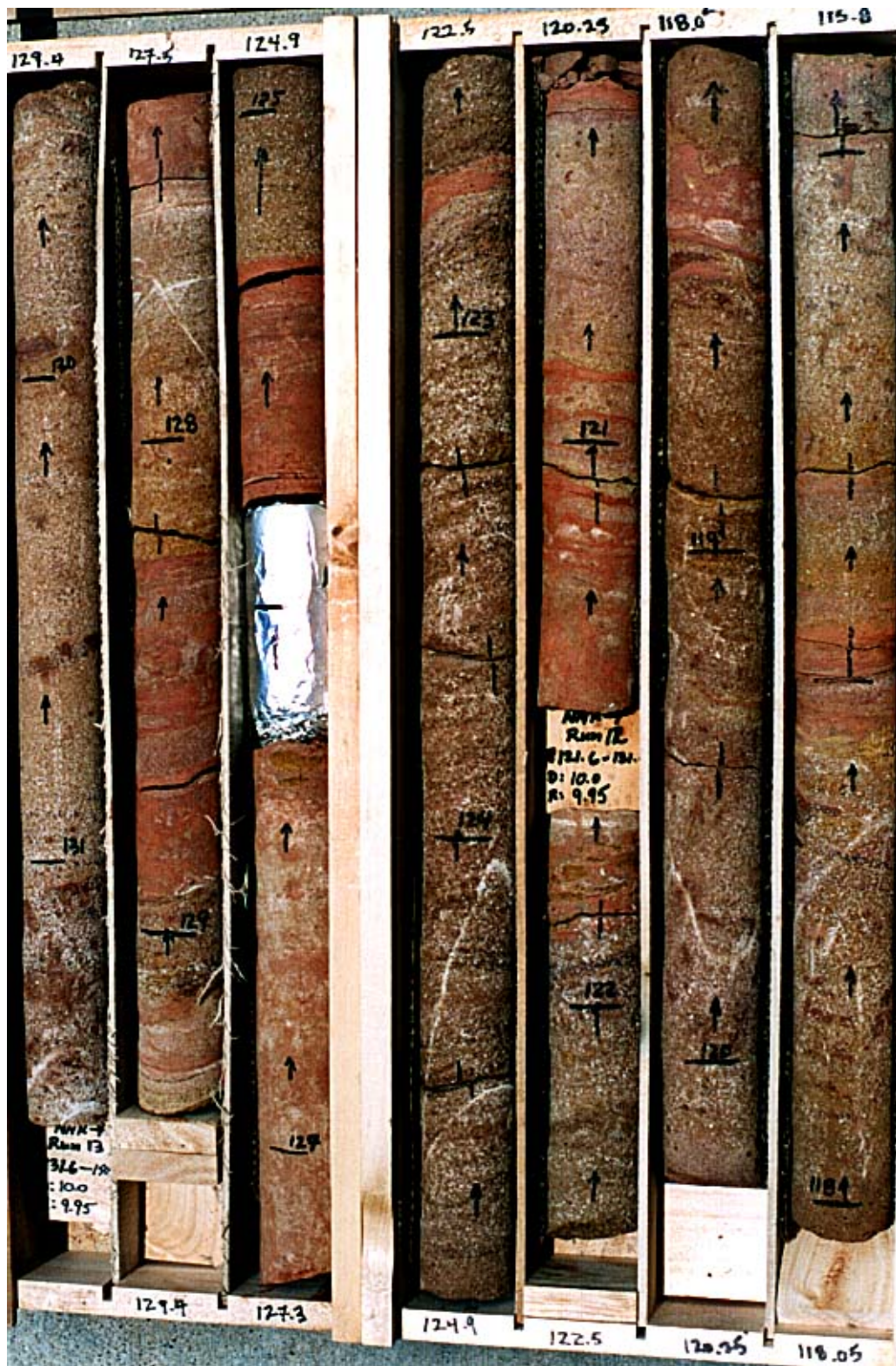


Figure 5: Core photograph of the Upper-Middle Hickory (50-135' below surface).



Figure 6: Core photograph of the Upper Hickory (0-50' below surface).