

## **Paleohydraulic Analysis of Meandering River Deposits, Petrified Forest National Park, Arizona**

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### **Abstract**

The Lithodrendon Wash 'Bed', in the Devils Playground area of Petrified Forest National Park, is part of an almost completely exposed section of the Triassic Chinle Formation. This specific unit has been studied previously for its intact 3D exposures of preserved point bar strata in both the vertical and plan- view dimensions. Using measured sections, interpreted satellite imagery, and sedimentary structure measurements this study reconstructs channel dimensions and paleo-discharge measurements for the Lithodrendon Wash Bed. Other contextual data, including an extensive fossil record, detrital zircon geochronology, paleoclimate data, and sedimentological research, is used to further constrain our interpretations and calculations of fluvial conditions of the Lithodrendon Wash 'Bed'.

We collected 12 measured sections, 300+ thickness of trough cross stratified beds, and 30+ channel-belt thickness measurements to help constrain the fluvial deposit dimensions. We also utilized satellite imagery to estimate planform metrics (e.g., radius of curvature). These independently measured datasets are used as inputs to existing empirical formulas to predict channel width and discharge of the fluvial system. Results derived from cross-sectional and plan-view data show strong correlation (<10% difference), highlighting the exceptional exposure of this system.

With the constrained parameters from the paleohydraulic reconstruction of the Lithodrendon Wash Bed, is it possible to use these as inputs into various fluvial modeling programs. We chose MeanderPy, as it's an open-source with a python interface. Today, no program can fully model a rivers dynamic environment, from hydraulics to stratigraphy, but many programs can model specific parts of that system. With MeanderPy, the planform patterns are the focus of the program, with bulk stratigraphic modeling and superposition a secondary feature. We demonstrate that we can recreate the Lithodrendon Wash bed patterns and can model what it may have looked like during, before, and after time of deposition.

The Lithodrendon Wash bed in Petrified Forest National Park is a world-class fluvial exposure where the plan form and vertical exposures of the rock record are preserved and mappable. Recent field work confirms the connection in the rock record between these two measurements tied to the river discharge. Modeling this system using MeanderPy with field collected parameters provides additional insights into stratigraphic construction and fluvial history.

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