
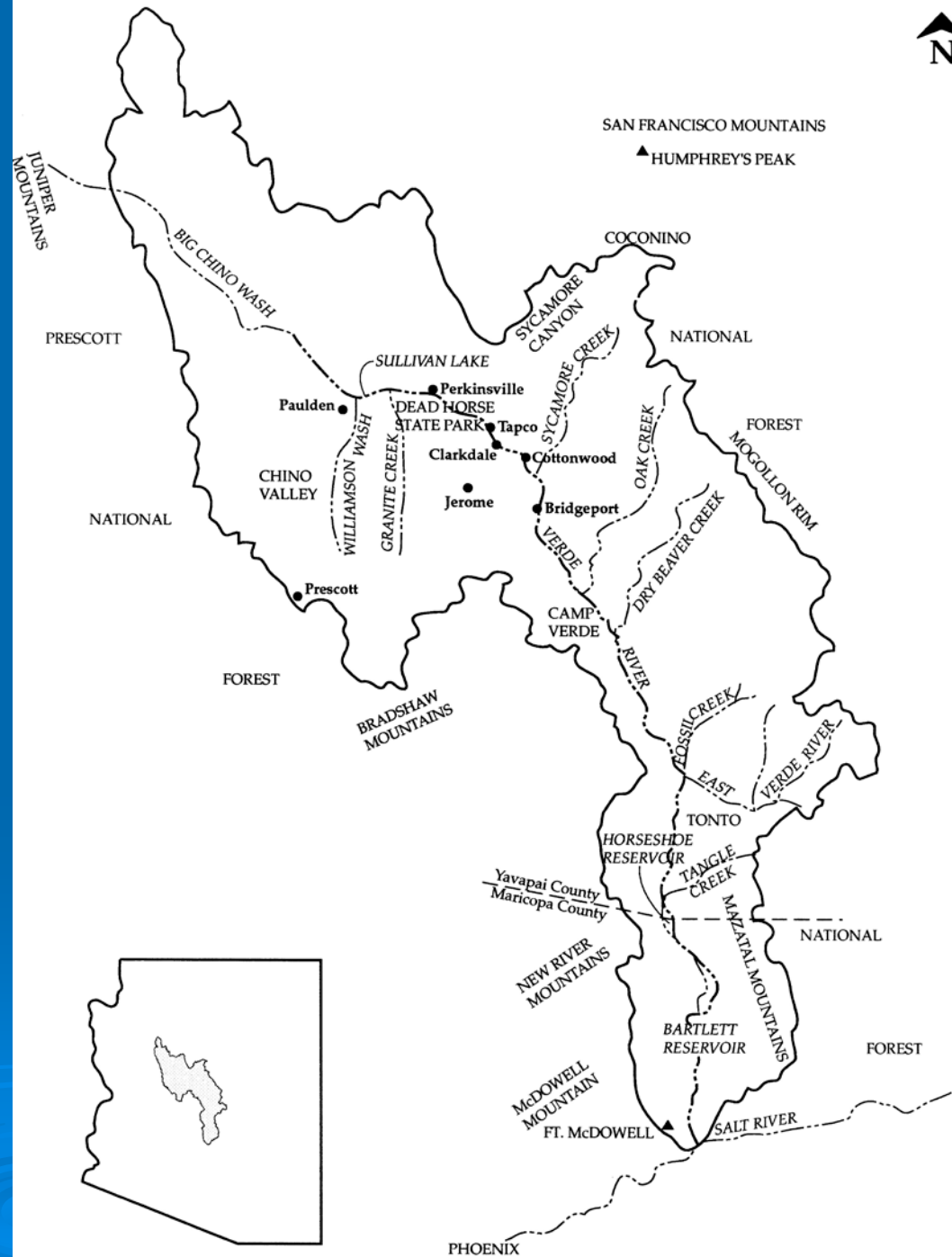


Verde River Navigability Study

ANSAC Hearing
November 17, 2005
Phoenix, AZ



Verde River in Arizona



Overview

➤ Verde River Navigability Study

- Sullivan Dam to Salt River Confluence
- Original Report
 - November 1993 – CH2M HILL
- Revisions
 - 1996 – JE Fuller/Hydro & Geo, Inc.
 - June 2003 – JE Fuller/Hydro & Geo, Inc.
 - Appendixes – unchanged, filed previously at ANSAC

➤ Team Members

- SWCA – Archaeology, History, Land Use (Fuller)
- AZGS – Geomorphology (Pearthree)
- JEF – Hydrology, Boating, Report (Fuller)

Overview

- Archaeology
- History
- Hydrology
- Geomorphology
- Land Use
- Boating



Overview

➤ Two Objectives

- Historical Navigation
 - *Navigable' or 'navigable watercourse' means a watercourse, or portion of a reach of a watercourse, that was in existence on February 14, 1912, and that was used or was susceptible to being used, in its ordinary and natural condition, as a highway for commerce, over which trade and travel were or could have been conducted in the customary modes of trade and travel on water.*
- Susceptibility to Navigation

Verde River

- Archaeological Data Summary
 - Hohokam-Sinagua-Apache Cultures
 - Irrigation Agriculture
 - Small systems (< 1 mi)
 - Perkinsville to Salt River
 - Water Supply
 - Communication Route
 - No Evidence of Boating

Verde River

➤ Historical Data Summary

- River Descriptions
- Boating Accounts
- Population Centers
- Regional Transportation
- River Uses

Verde River

➤ Historical Data Summary

- Spanish Exploration (1583-1604)
- Fur Trappers (1826-1844)
- US Army: Sitgreaves & Whipple (1851-1853)
- 1864-1870
 - Mining @ Lynx Creek, Jerome, Clarkdale
 - Camp Lincoln (Ft. Verde)
 - Ft. McDowell
 - Agriculture in Verde Valley
 - Irrigation Diversions
- 1895: Railroad at Jerome

Verde River

➤ Historical Data Summary

- River Descriptions (Pre-1891 in Verde Valley)
 - Perennial, Clear Stream
 - Marshy in Verde Valley
 - Fish, Beaver, Tree-Lined
- River Descriptions (Post-1891 Flood)
 - Main Channel Deeper, Wider
 - Less Marsh & Swamp
 - Perennial, Large Stream

Verde River

➤ Historical Data Summary

- Historical Boating Accounts

- Middle Verde

- Ft. Verde – Collapsible Boat, ca. 1887, High Water, Fishing
- 1899: Boat hauled rock for Perkinsville Dam
- 1903: Palmer & Crain, Duck Hunting in Steel Boat
- 1931: Fogel & Gireaux, Trapping, Clarkdale to Ft. McDowell, Flat-Bottomed Boat

- Lower Verde

- 1883: Willcox & Andrews, Ft. McDowell to Salt River
 - Canvas skiff
- 1888: Spaulding & Hatfield, Ft. McDowell to Salt River
 - Canoe

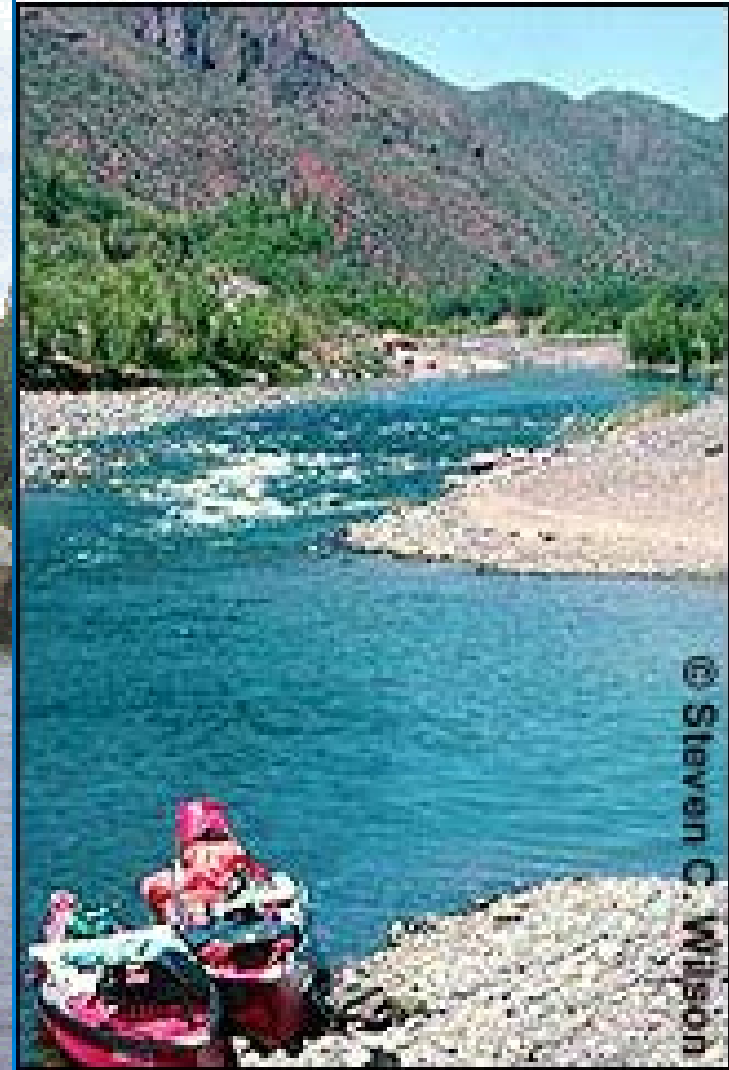
Verde River

➤ Geomorphology

- Dr. Philip Pearthree/AZ Geological Survey



Pool & Riffle Streams



© Steven C. Wilson

Verde River below Childs

Pool & Riffle Streams



Verde River at Clay Banks Rapid @ 152 cfs

Pool & Riffle vs. Braided Stream



Braided River Pattern



Pool & Riffle Pattern

Pool & Riffle Streams



Verde River

➤ Hydrology

- Perennial Stream
 - Spring-Fed Base Flow
 - Seasonal Variation
- Irrigation Diversions
 - 1914: 25 Diversions, 121 cfs
 - Verde Valley – Diversions date to 1860's
- Statehood
 - Long-Term Average is Representative
 - Tree Ring Data, Flow Measurement
 - Above-Average Cycle Near Statehood

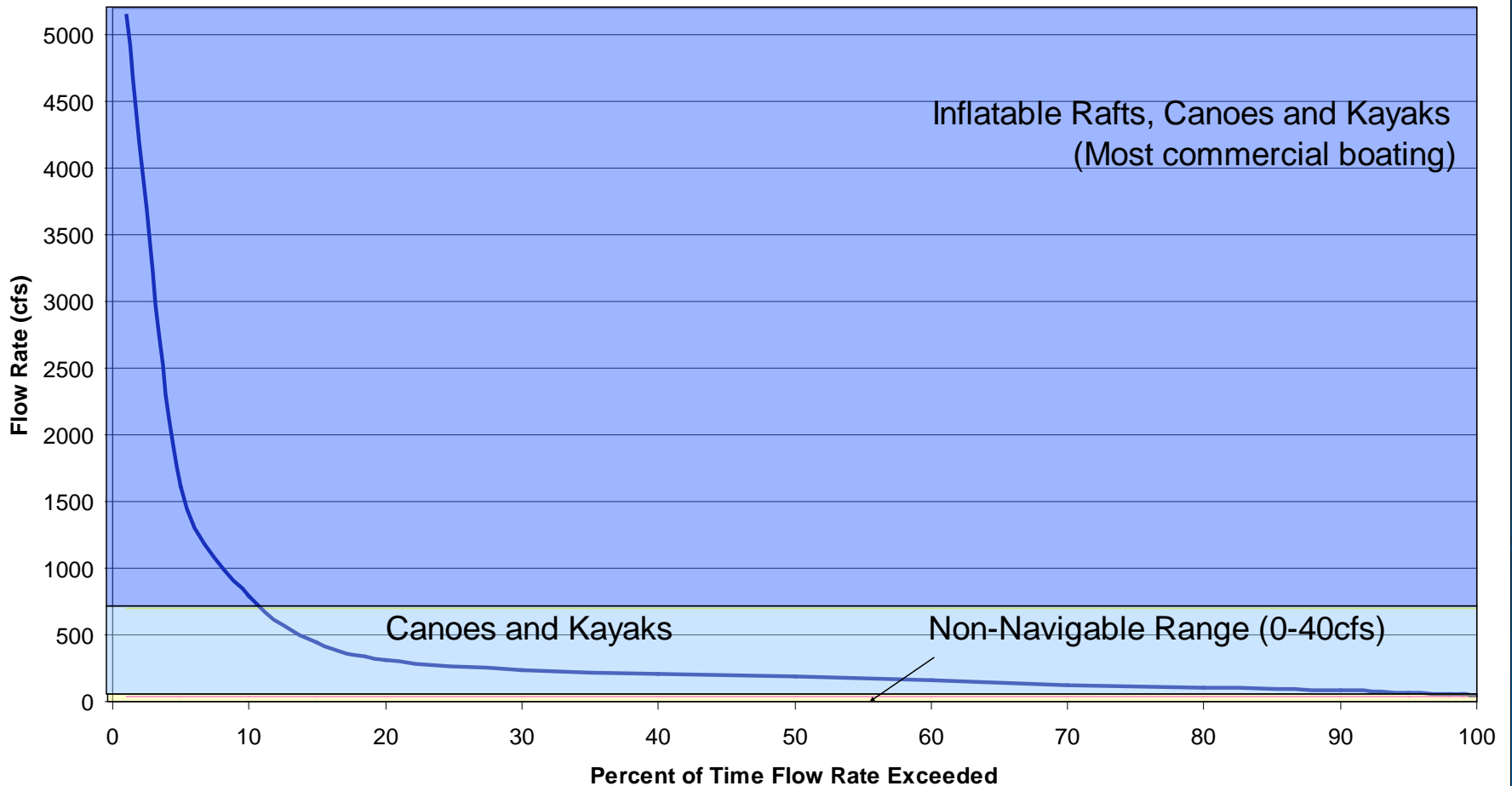
Verde River Hydrology

➤ USGS Stream Gauge Data

	<u>Median (50%)</u>	<u>Range 10%-90%</u>
• Paulden	25 cfs	22-31 cfs
• Clarkdale	85 cfs	70-236 cfs
• Camp Verde	189 cfs	84-439 cfs
• Tangle Creek	238 cfs	120-917 cfs
• McDowell	> 238 cfs	

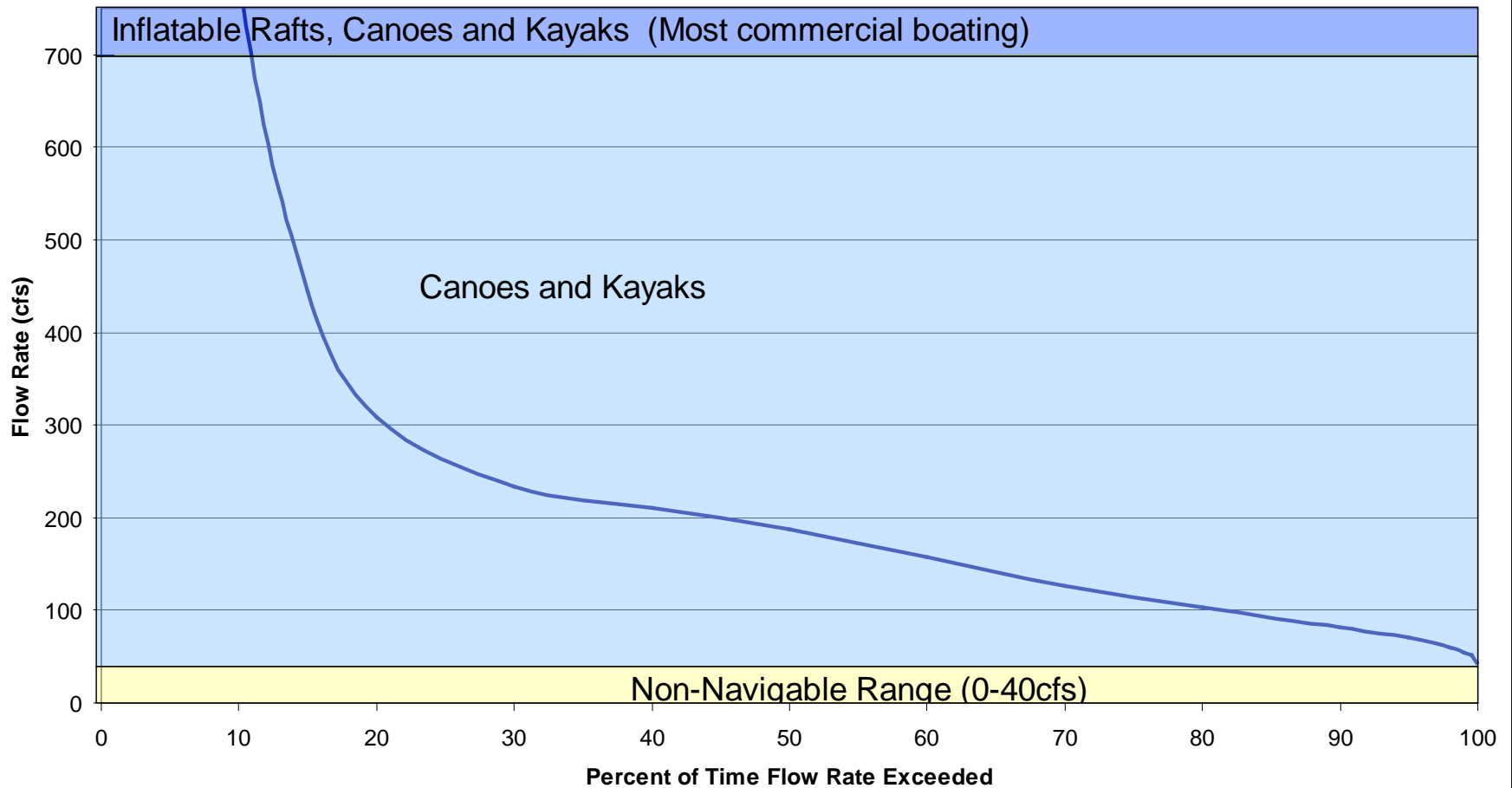
Verde River Hydrology

Verde River-Ordinary Flow Rates
Verde River near Camp Verde



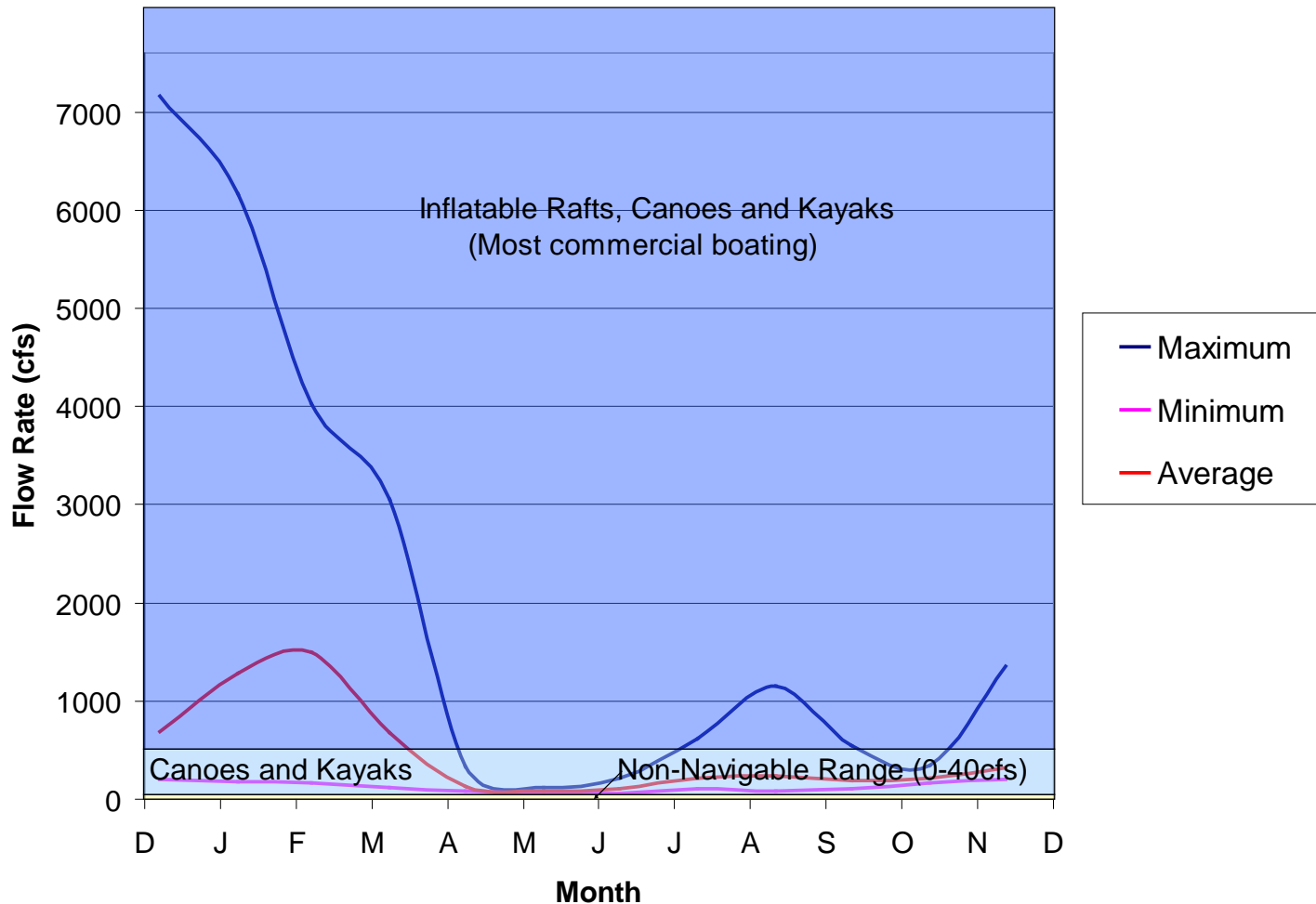
Verde River Hydrology

Verde River-Ordinary Flow Rates
Verde River near Camp Verde



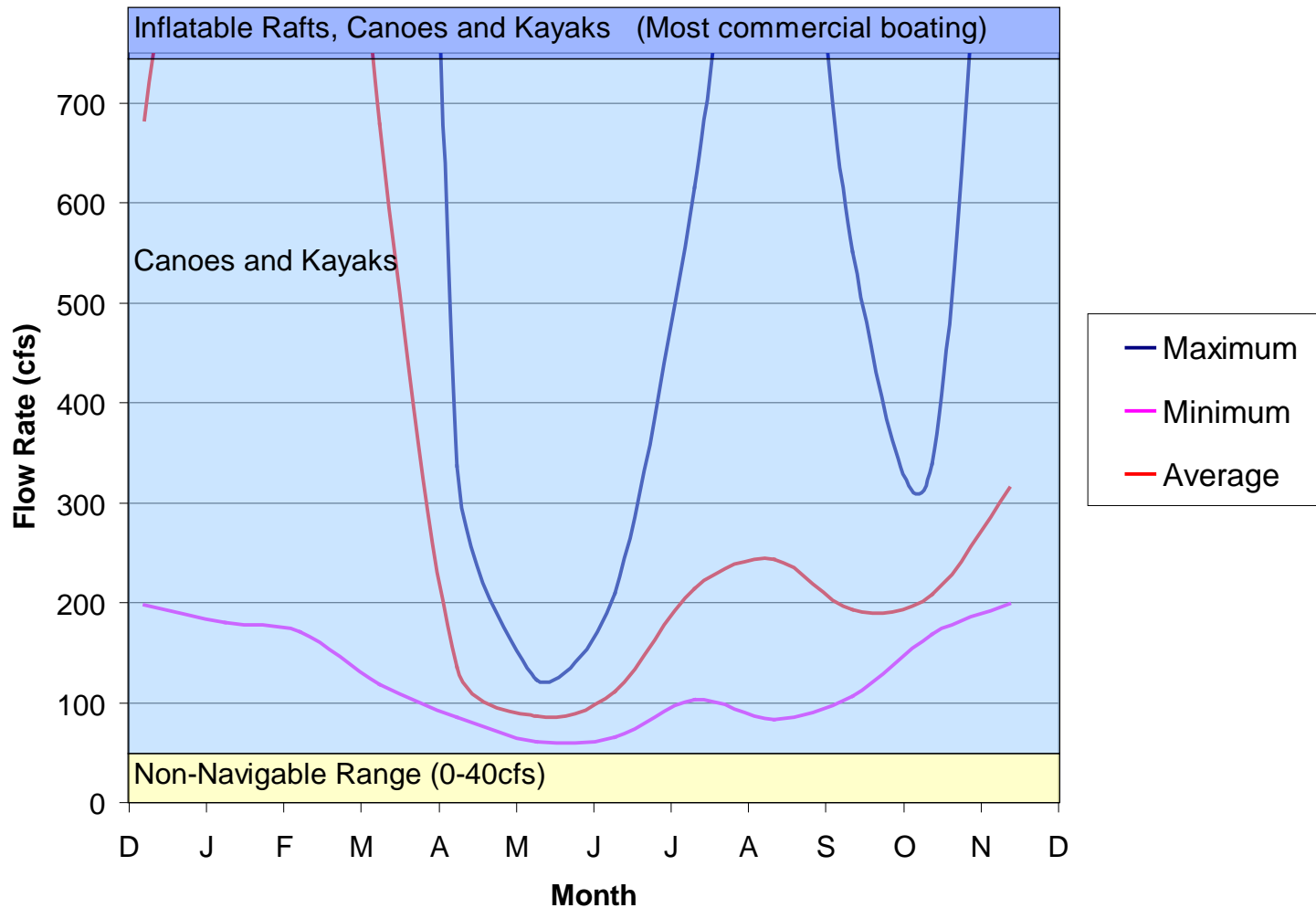
Verde River Hydrology

Verde River - Monthly Flow Rates
Verde River near Camp Verde



Verde River Hydrology

Verde River - Monthly Flow Rates
Verde River near Camp Verde



Verde River

➤ Flow Data

- Monthly/Seasonal Flow Rates
- Average, Median, Minimum Monthly & Annual
- Flood Records
- Published Sources - Standard of Practice

➤ Rating Curves

- Depths sufficient for shallow draft boating in every month at every station
- USGS Gauge Station Rating Curves
- Field Checked

Verde River Boating

- Historical Accounts
- Modern Recreational Boating
 - Very Common
 - Seasonal Increase
 - Annual Boat Races
 - International Mention
 - Published Boating Guides
 - Web Sites
 - USFS Monitoring



Verde River Boating

- USFS Beasley to Horseshoe Records
 - January 2001 to March 2005
 - 863 Boaters
 - 728 Boats (Canoe, IK, Kayak, Raft, Cataraft)
 - Voluntary Registration
 - Every Month of Year
 - Lowest Discharge 44 cfs (7-10-02)
 - Boaters From Nine States
 - AZ, CA, CO, CT, ID, MO, NV, TX, UT

Verde River Boating Season

