Boating in Arizona
ca. 1912

Speaker Resume: Fuller

- Navigability Studies
  - Arizona: 1992-2014
    - All Major River Systems
    - 30,000+ Small & Minor Watercourses
  - Alaska, Rocky Mountain States, East Coast
- Professional Experience (30 yrs in Arizona)
  - Hydrologist (PH)
  - Engineer (PE)
  - Geomorphologist (RG)
- Boating Experience
  - Canoe, Kayak, Raft
  - AZ (Gila, Salt, Verde, Virgin, San Francisco, Colorado)
  - NM, CO, UT, CA, AK, NC, GA, SC, TN, NY, MI, WI

Introduction

- Federal Standard for Title Navigability (Daniel Ball Test)
  - Ordinary & Natural
  - Used or Susceptible
  - Highway for Commerce
  - Trade & Travel <u>on Water</u>
  - Customary Modes

"Navigable" or "navigable watercourse" means a watercourse that was in existence on February 14, 1912, and at that time 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.

A.R.S. § 37-1101(5)

Introduction

- Ordinary & Natural
  - Discussed in other ASLD presentation
  - Prior to human disturbance of river system

- On Water
  - Boats, watercraft
  - NOT: wagon, hoof, or feet on streambeds

Introduction

- Trade and Travel on Water
  - Trade (exchange of commodities)
  - Travel (go on as if on a trip or tour)
- Susceptible to Trade and Travel
  - Sufficient depth of flow
  - Actual historical use not required
- Customary Modes
  - Boats available at statehood

"Navigable" or "navigable watercourse" means a watercourse that was in existence on February 14, 1912, and at that time 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."

A.R.S. § 37-1101(5)

Trade & Travel on Water ca. 1912

- Typical Trade/Travel Uses ca. 1912
  - Hauling Goods
  - Hauling Passengers
  - River Guiding
  - Exploration
  - Military
  - Ferries
  - Fishing
  - Trapping/Hunting
  - Survey
  - Travel
  - Carrying Mail

General Boat Types Used			
Large	Steamboat	Flatboat	Canoe
√	√	√	√
√	√	√	√
		√	√
	√	√	√
√	√	√	√
√	√	√	√
√	√	√	√
		√	√
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√	√	√	√
√	√	√	√

Historical Boat Types, ca. 1912

- Boats Available in & Near Arizona ca. 1912
  - Steamboats
  - Flat boats, Skiffs, Scows, & Rafts
  - Canoes
  - Rowboats, Dories & Riverboats
  - Ferries
  - Many Others Available
    - Inflatable, Motor, Kayaks, Dugouts
  - Boats were adapted to fit specific rivers & uses

Historical Boats: Example

- Early Boating in Western States
  - "Commercial boating limited to canoes, flatboats & keelboats."
  - Example:
    - Lower Missouri River (MS, KS, IA, NE, SD, ND, MT) is clearly navigable.
    - 27 yrs required to acquire skills and develop the type of boats needed to navigate the Missouri.
    - Sand bars were a challenge… but were overcome with time.

"Before 1830, **commercial boating in the West was limited to canoes, flatboats and keelboats**. In that year the first steamboat left St. Louis headed up the Missouri River. Within three years, steamboats had reached the junction of the Yellowstone River in eastern Montana, though **it would take another 27 years to "evolve the boats, the experience and the maneuvers required to navigate the Missouri**." The principal difficulty going upriver was in getting off or over sand bars. Often the freight would have to be unloaded, or some of it towed on a barge behind the boat."

Source: River Boats in America, 1966

Historical Boats: Example

- Adapted Uses: Sweep Scows
  - Unique boat types for each river
    - Salmon River – rocky, fast current
  - Downstream use only
  - Hauled freight
  - Hauled tourists
  - Boat sold for lumber at river's end

Sweep boat, or scow used on the Salmon River, a variant of the Mississippi River flatboat, 16 to 35 ft. long, 5 to 10 feet wide, with sidewalls 3 to 4 ft. deep. They had no power source other than the river current, and long sweep oars at bow and stern to steer. These craft appeared on the Salmon River in ***1872*** and were used through the 1920s. Like the flatboats, these were cheap but sturdy boats intended for hauling freight down a river. ***At the completion of the voyage, the boat would be sold for scrap***. "By ***1900***, Harry Guleke had adopted sweep boating as his trade and, like the old flatboat men, would work his way downstream buying, selling, trading and delivering many tons of goods, ***always selling the boat for lumber*** at the end of the journey. Guleke took the trade a step farther by ***taking tourists through the gorge***."

Source: Anderson, 2013

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Salmon River is Navigable

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Source: Anderson, 2013

Historical Boats: Example

- Special Master Report, Utah Riverbed Case, 1931
  - "The watercraft most commonly used in commercial navigation have been row boats of 16-18′ in length, drawing 6-12", row boats 18-22′ long, drawing 14-18", steel rowboats 18′ long, drawing 7-19", motor boats of 20-27′ length drawing 10"-2′, rowboats 16-18′ length, propelled by outboard motors drawing 15-18"; scows 32′x8′ and 24′x6, drawing 8", and rafts."
  - Canoes – exploration, cargo, trapping, hunting

Historical Boat Materials, ca. 1912

Material	When 1st Used
Wood	B.C.
Metal (copper, steel, aluminum)	1800's
Canvas	1800's
Skin	B.C.
Rubber	1800's
Composite	1800's

- Other (frame, wicker, reed, inflatable, pottery) materials were used by indigenous people centuries before western expansion of USA.

Historical Boating Accounts in AZ

- Types of Boats Used in Arizona
  - Steamboats (Colorado River, Lower Gila River)
  - Flatboats (Salt, Gila, Verde)
  - Ferries (Salt, Gila)
  - Rowboats (Salt, Gila, Verde)
  - Canoes (Salt, Gila, Verde)

  - Floating Logs (Gila, Salt, San Francisco)

Historical Boating Accounts in AZ

- Seasons Boated
  - Throughout the Year — Spring-Summer-Fall-Winter
- Flow Rates Boated
  - Normal low water: — Yes
  - Normal high water: — Yes
  - Floods — Not ordinarily
- Boats Were Available When Needed
  - If rivers weren't boatable, why did people have boats?

Historical Boat Types

- Steamboats
  - Large Vessels
    - Adapted for river conditions
    - Used on major rivers
  - Colorado River, 1865-1908
    - Ended with Imperial Dam
    - Competition from Railroad
  - Gila River
    - Segment 8
    - Occasional use

Yuma Landing, 1885

Historical Boat Types

- Steamboats

  See Lingenfelter, 1978

  - Specifications: ~60-150 ft
  - Draw: ~19" (fully loaded)
  - Typical Uses
    - Shipping, Passengers, Exploration, Military, Travel, Mail
  - Availability – in Arizona prior to 1912
  - Use on Arizona Rivers
    - Colorado, Gila

Historical Boat Types

The "Cochan" on the Colorado River near Yuma, 1900

Historical Boat Types

- Steamboats in Arizona
  - Traffic dried up after railroad in 1877, p. 49
  - Imperial Dam was obstruction to thru-boating
  - Draw: 30" fully loaded, p. 37. Later 19"
  - Technique for sandbars, p. 49
    - "Crawfish" – stern 1st, use paddle wheel to claw through

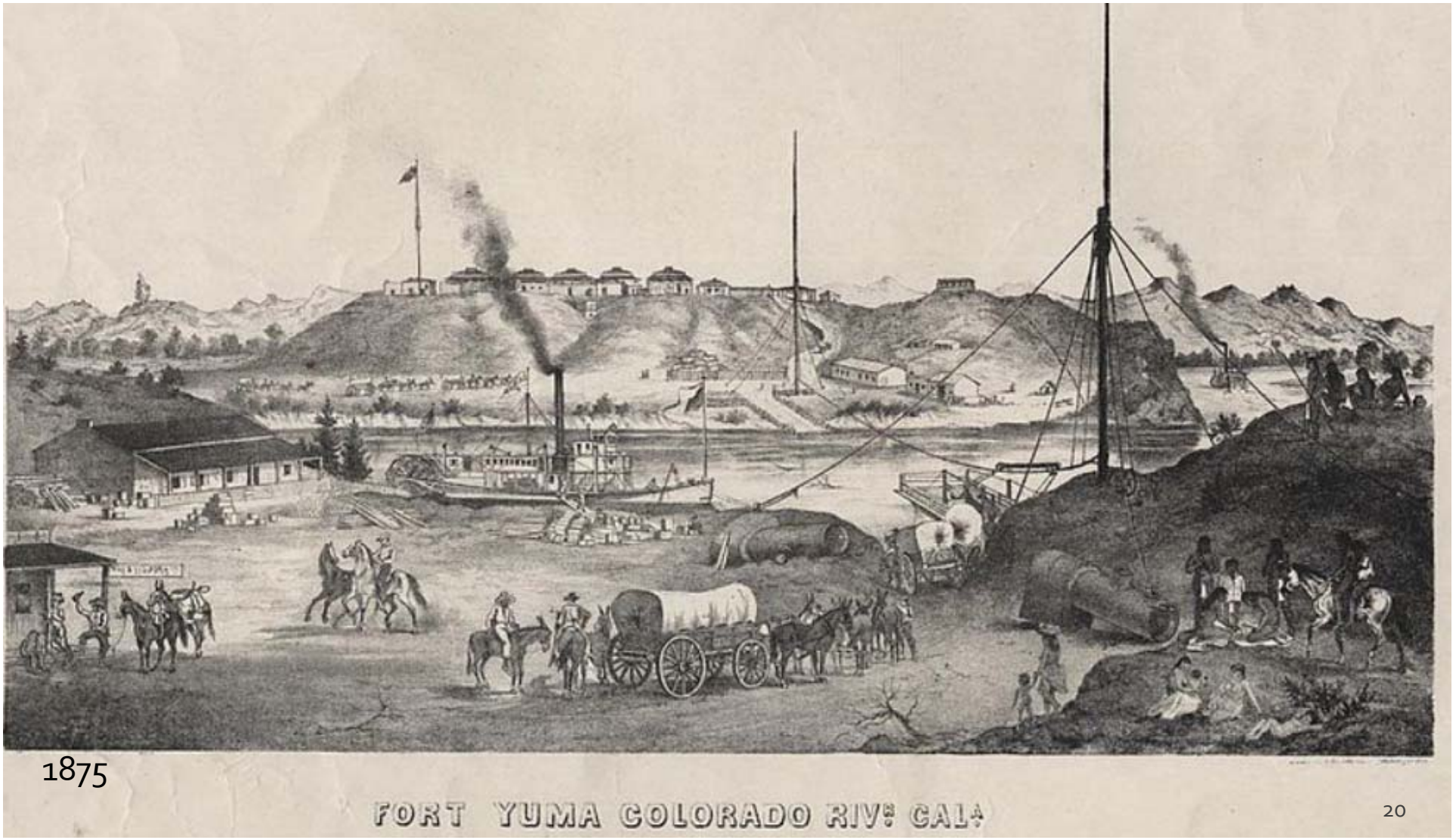
Source: Swanson & Altschul, 1989, Cultural Resources Investigations of the Yuma Quartermaster Depot.

Historical Boat Types, ca. 1912

- Steamboats Used on the Navigable Colorado
  - Navigable in high stage
  - Boulders, snags & sandbars
  - Navigation difficult & dangerous
  - Remote
  - Powerful floods
  - Steamboat use ended when Imperial Dam built above Yuma
    - Use not compatible with irrigation diversions & dams

Sources: Arizona Territorial Legislature (1866); Steamboats on the Colorado (1978)

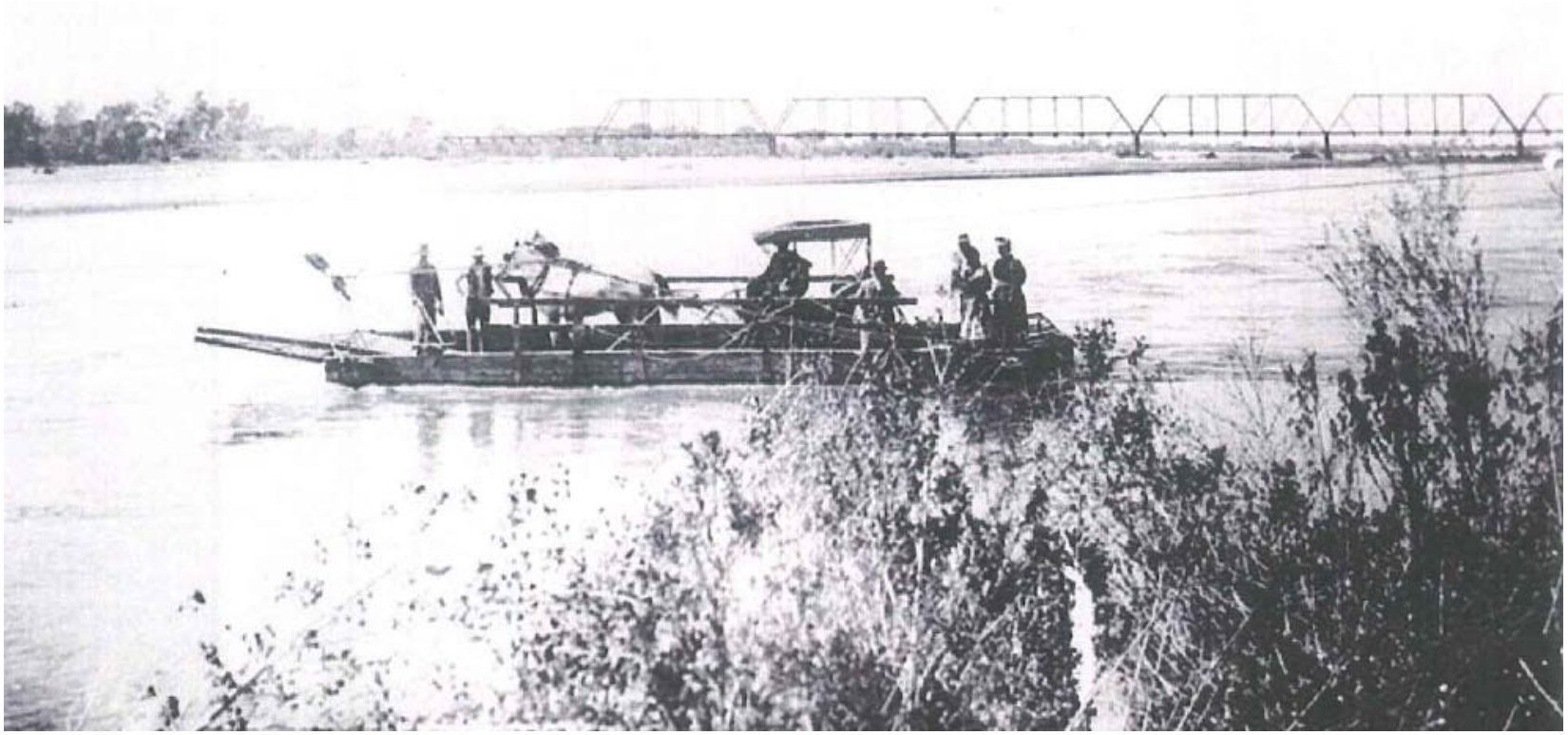
Historical Boat Types



1875

Historical Boat Types

- Ferries



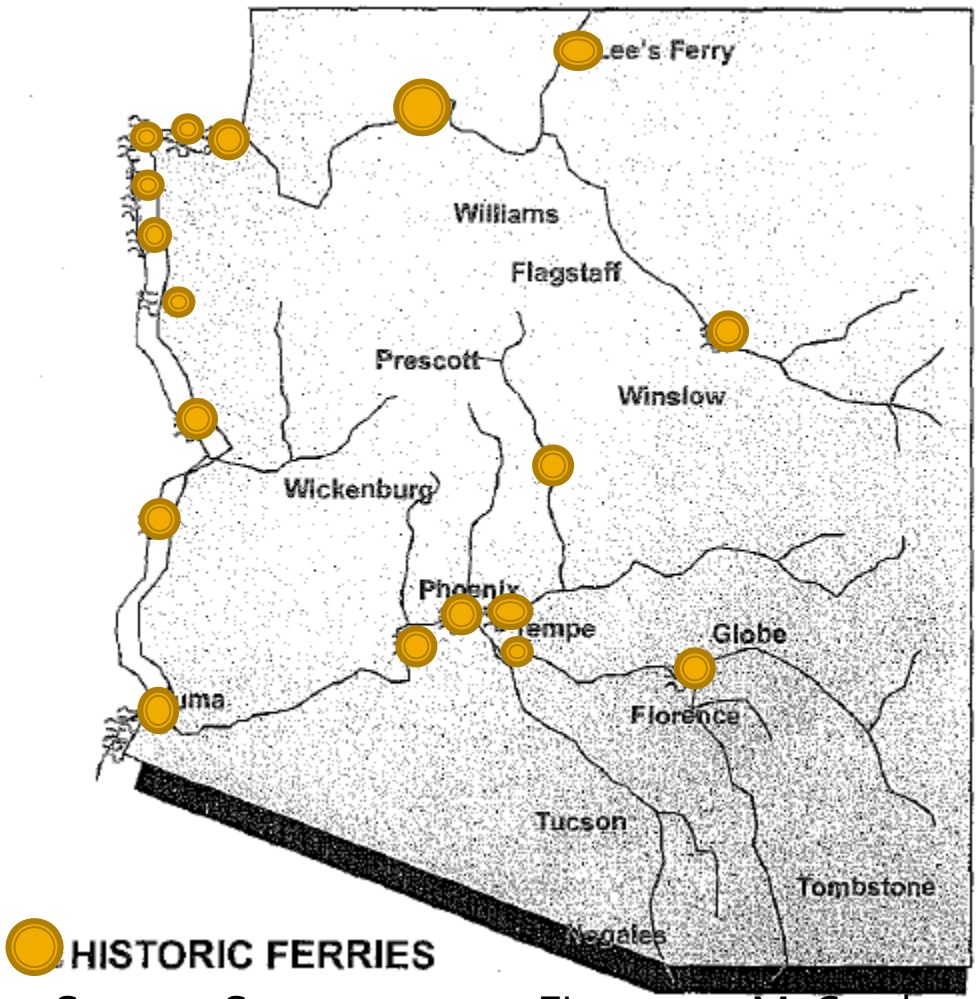
Hayden's Ferry – Salt River @ Tempe

Historical Boat Types

- Ferries
  - Specifications: Vary widely (6-35 ft)
  - Minimum Depth of Flow: 2 ft*
  - Typical Uses
    - Commercial, Passengers, Travel, Military, Mail
  - Availability: In Arizona
  - Use on Arizona Rivers
    - Actual Historical (Salt, Gila, Colorado, LCR)

*Ferries only needed if rivers couldn't be easily forded

Historical Boat Types



Source: Stantec, 2005 – Figure 3.1; McCroskey, 1989

Ferry Use in Arizona

- Used to Cross Rivers
  - Not downstream/upstream
- Ferry types, size, & shape vary
  - Barge-like
- Materials
  - Reeds, clay, hide, wood, steel
- Eventually replaced by bridges
- Some used seasonally
  - Seasons of high water
  - Others used year round

- **Demonstrate susceptibility to boating**
  - **Sufficient depth for large boats**

Historical Boat Types

- Flat Boats, Skiffs, Rafts
  - Specifications: Sizes vary widely (8-30 ft)
    - Often homemade
  - Minimum Depth of Flow: ~2 ft.
    - Shallow draft boats
  - Typical Uses
    - Hauling goods, travel, passengers, exploration, ferries
  - Availability: In Arizona
  - Use on Arizona Rivers
    - Actual Historical (Salt, Gila, Verde, San Francisco)

Historical Boat Types

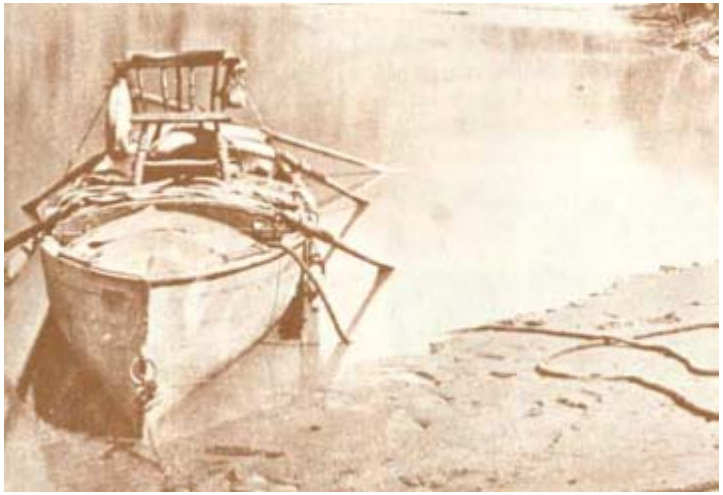
- Flat Boats, Skiffs & Rafts
  - Strip Skiff (15’ long, 3’ wide)
  - Board Skiff (2 board bottom & sides, common)
  - Canvas Skiff (over wood frame)
- Propelled by Poles, Oars, Current
  - Without oars & experience, these boats are difficult to control
  - Uncontrolled boats experience more difficulties

Historical Boat Types

- Flat Boat
  - Add photo/sketch

Historical Boat Types

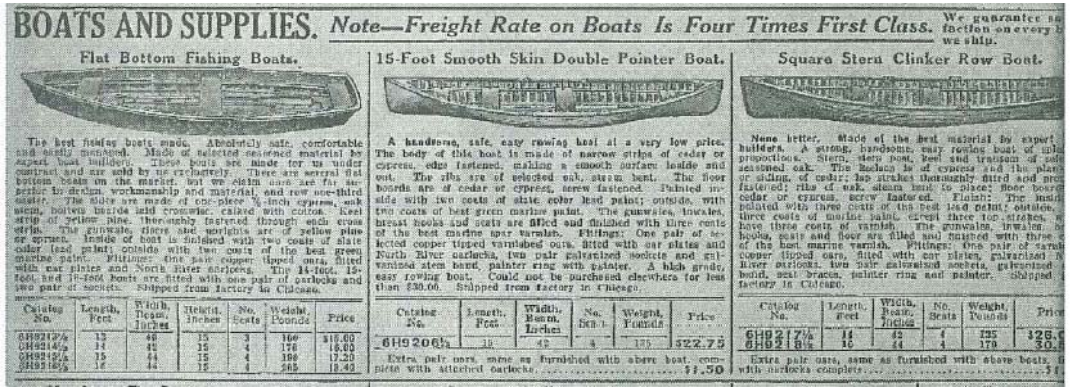
- Rowboats & Dories



Historical Boat Types

- Rowboats & Dories
  - Specifications Sizes vary widely (6-22 ft)
  - Minimum Depth of Flow: 3 inch to 2.5 ft
  - Typical Uses
    - Hauling Goods, Passengers, Recreational, Exploration, Travel, Trapping/Hunting, Survey, Mail
  - Availability: In Arizona
  - Use on Arizona Rivers
    - Actual Historical (Salt, Gila, Verde, Colorado)

Historical Boat Types



BOATS AND SUPPLIES. *Note—Freight Rate on Boats Is Four Times First Class.* We guarantee satisfaction on every boat we ship.

Flat Bottom Fishing Boats.

The best fishing boats made. Absolutely safe, comfortable and easily managed. Made of selected seasoned material by expert boat builders. These boats are made for us under contract and are sold by us exclusively. There are several flat bottom boats on the market, but we claim ours are far superior in design, workmanship and material, and row one-third easier. The sides are made of one-piece ⅝-inch cypress, oak stem, bottom boards laid crosswise, calked with cotton. Keel strip of yellow pine, thoroughly fastened through each cross strip. The gunwales, risers and uprights are of yellow pine or cypress. Inside of boat is finished with two coats of slate color lead paint; outside with two coats of the best green marine paint. Fittings: One pair copper tipped oars, fitted with oar plates and North River oarlocks. The 14-foot, 15-foot, and 16-foot boats are fitted with one pair of oarlocks and two pair of sockets. Shipped from factory in Chicago.

Catalog No.	Length, Feet	Width, Beam, Inches	Height, Inches	No. Seats	Weight, Pounds	Price
6H9212½	12	40	15	3	160	$16.00
6H9214½	14	42	15	4	178	18.00
6H9215½	15	44	15	4	198	17.50
6H9216½	16	44	15	4	569	19.40

15-Foot Smooth Skin Double Pointer Boat.

A handsome, safe, easy rowing boat at a very low price. The body of this boat is made of narrow strips of cedar or cypress, edge fastened, making a smooth surface inside and out. The ribs are of selected oak, steam bent. The floor boards are of cedar or cypress, screw fastened. Painted inside with two coats of slate color lead paint; outside, with two coats of best green marine paint. The gunwales, inwales, breast hooks and seats are filled and finished with three coats of the best marine spar varnish. Fittings: One pair of selected copper tipped varnished oars, fitted with oar plates and North River oarlocks, two pair galvanized sockets and galvanized stem band, painter ring with painter. A high grade, easy rowing boat. Could not be purchased elsewhere for less than $30.00. Shipped from factory in Chicago.

Catalog No.	Length, Feet	Width, Beam, Inches	No. Seats	Weight, Pounds	Price
6H9206½	16	42	4	175	$22.75

Extra pair oars, same as furnished with above boat, complete with attached oarlocks $1.50

Square Stern Clinker Row Boat.

None better. Made of the best material by expert builders. A strong, handsome, easy rowing boat of ideal proportions. Stern, stern post, keel and transom of selected oak. The bottom is of cypress and the planks or siding, of cedar; lap strakes thoroughly fitted and properly fastened; ribs of oak, steam bent to place; floor boards cedar or cypress, screw fastened. Finish: The inside painted with three coats of the best lead paint outside, three coats of marine paint except three top strakes, which have three coats of varnish. The gunwales, inwales, breast hooks, seats and floor are filled and finished with three coats of the best marine varnish. Fittings: One pair of varnished copper tipped oars, fitted with oar plates, galvanized North River oarlocks, two pair galvanized sockets, galvanized bow bolt, seat braces, painter ring and painter. Shipped from factory in Chicago.

Catalog No.	Length, Feet	Width, Beam, Inches	No. Seats	Weight, Pounds	Price
6H9217½	14	42	4	185	$26.00
6H9218½	16	44	4	170	30.00

Extra pair oars, same as furnished with above boats, complete with oarlocks complete $1.50

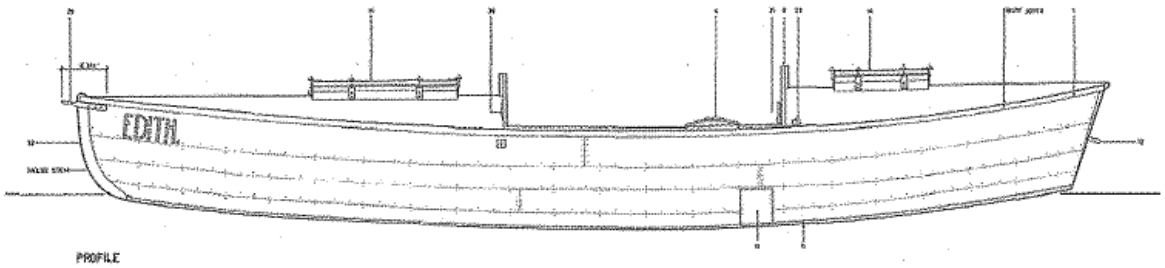
1895 Montgomery Wards Catalog:

- Wood & Canvas Rowboats
- Mail order availability

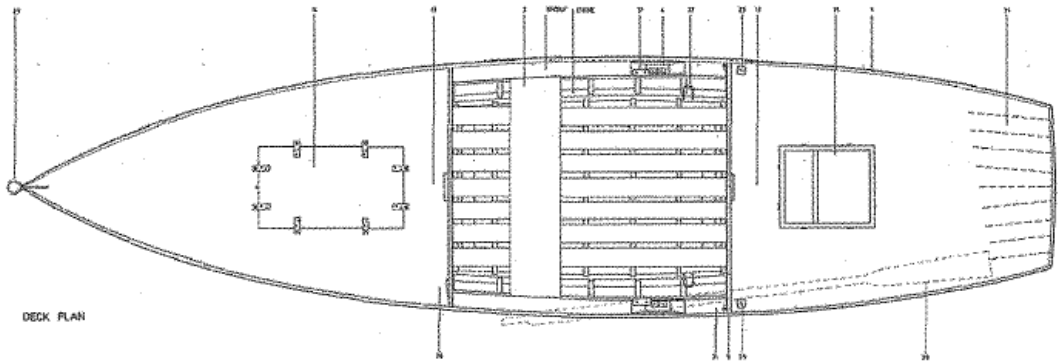
Rowboats available from 1912 Sears Catalog

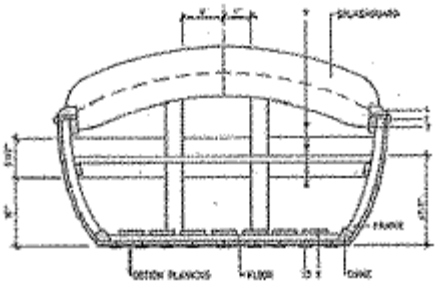
The "Edith" in GCNP collection, Kolb brothers 1911

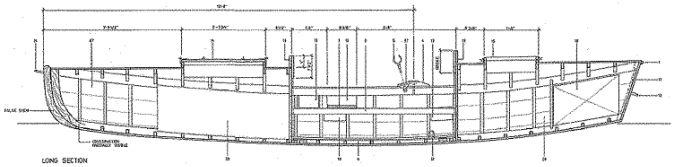
Wood Boat Specifications: Edith (ca. 1911)

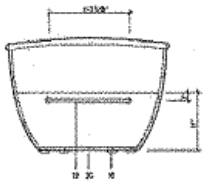


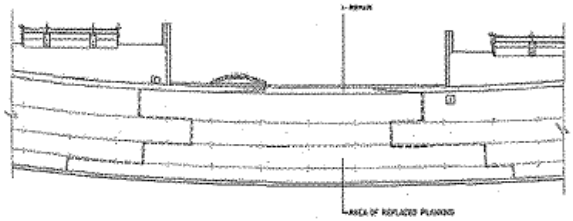
PROFILE


DECK PLAN


MID-SHIPS SECTION LOOKING FORWARD


LONG SECTION


TRANSOM PROJECTED


STARBOARD REPAIR

Used by Kolb Brothers
Draw: < 1 ft
Load: 2,000 lbs

Historical Boat Types

Relict Homemade Rowboat on Green River

Historical Boat Types

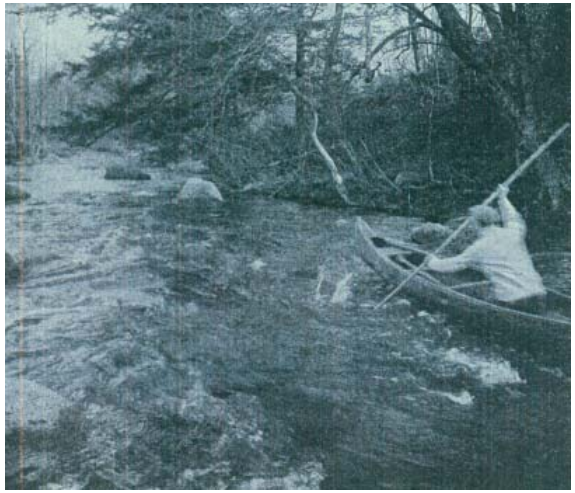
- Canoes

Historical Boat Types

- Canoes
  - Specifications Sizes vary widely (8-25 ft)
  - Minimum Depth of Flow: 6 inches
  - Typical Uses
    - Hauling Goods, Passengers, River Guiding, Exploration, Military, Fishing, Trapping, Travel, Mail
  - Availability: In Arizona
  - Use on Arizona Rivers
    - Actual Historical (Gila, Salt, Verde, many others)

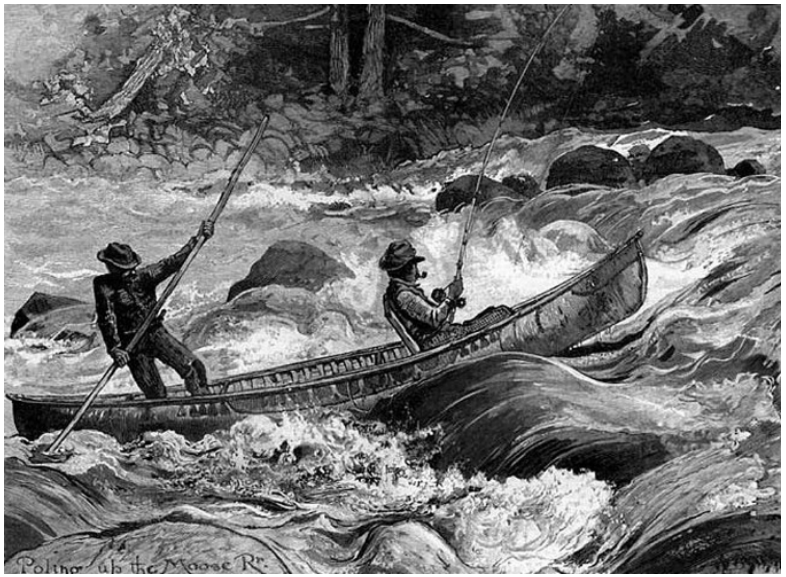
Historical Boat Types

- Canoes
  - Dugouts – single log
  - Strip – fitted wood pieces
  - Canvas – metal or wood ribs
  - Upstream travel (poling)
  - Many other types of canoes available, modified for the type of water & intended use.

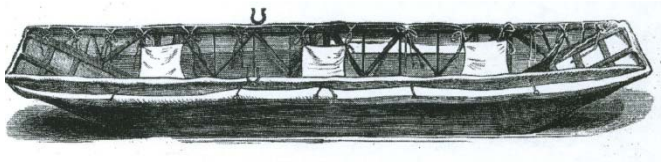


Country Life Magazine, 1908

Historical Boat Types



Historical Boat Types



- Canvas Folding boats
  - Specifications: 5-12 ft
  - Minimum Depth of Flow: 3 inches
  - Typical Uses
    - Hunting, Fishing, Trapping, Travel, Military, Exploration
  - Availability: In Arizona
  - Use on Arizona Rivers
    - Actual Historical (Gila, Verde, Salt)

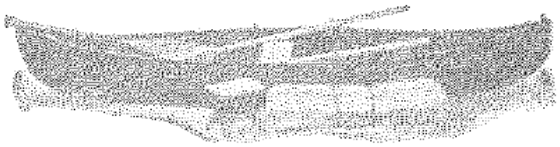
Historical Boat Types: Folding Canoes & Rowboats

King Folding Boat Co, ca. 1880's
Canvas over wire frame

Kolb brothers & others in canvas canoe

LIFE SAVING FOLDING CANVAS BOAT.

Made by Life Saving Folding Canvas Boat Co., Kalamazoo, Michigan.



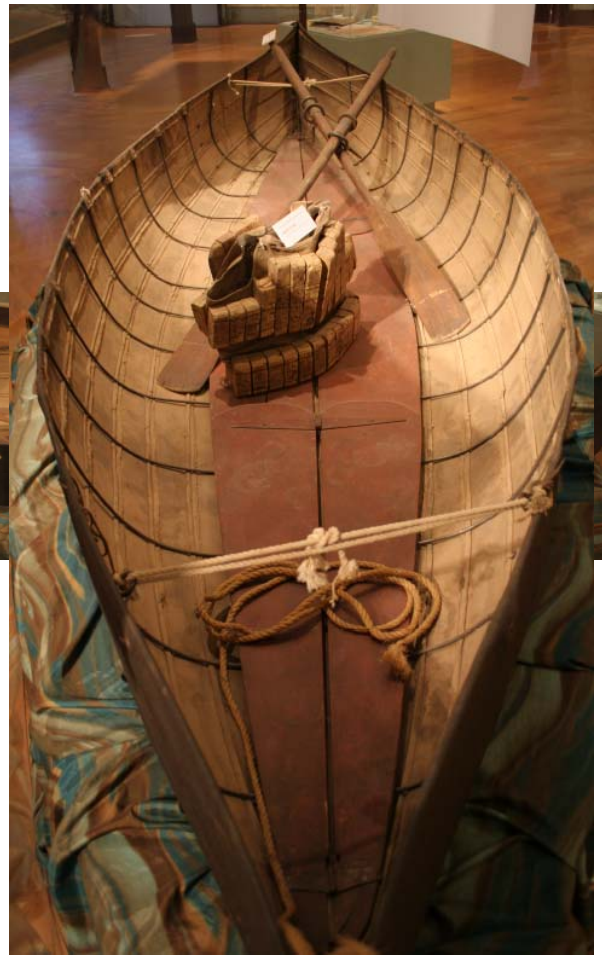
These boats are splendid for hunters, trappers, fishermen or pleasure, safe and steady, the **12 foot regular** 37 inch beam, 12 inches deep, 20 inches at ends, with jointed oars or double paddles, carrying case, thwart seats and spreaders, air chambers and camp chair, capacity 700 pounds. Weight 55 pounds, package is 4 feet by 9 inches by 11 inches. Price $33. This boat will carry three persons nicely. Given for EIGHTY-FIVE New Subscribers.

The **9 foot boat,** suitable for a trapper or hunter, 32 inch beam, 10 inches deep, 16 inches at ends, with jointed oars or double paddles, carrying case, thwart seat and spreaders, air chambers, capacity 350 pounds, package is 3 feet by 8 inches, weight 30 pounds, price $25. Given for SIXTY New Subscribers.

Always mention the HUNTER-TRADER-TRAPPER when writing to advertisers.

Hunter-Trader-Trapper Magazine, 1908

Historical Boat Types



Historical Boat Types

- Canvas Canoes, 1911 Publication
  - "In years past, 1000's of stream could not be reached [until] the folding canvas boat.."
  - 9 ft boat: carries 350 lbs, costs $25
  - 20 ft boat: carries 3,000 lbs, costs $65.
  - Described as more reliable than inflatable boats.

Source: Outing with Portable Equipment, 1911

Hunter-Trader-Trapper, 1912
Guaranteed, Outlast Wood or Steel boats, Safe

Historical Boat Types

- Canvas Canoes
  - Numerous manufactures, shipped anywhere
  - Elastic rigidity (deflects snags & rocks)
  - Very low draft (clears 1" depths)
  - Military usage (more durable than wooden boats)

Outing with Portable Equipment, 1911

Historical Boat Types

- Inflatables
  - Specifications: Varies (8-30 ft)
  - Minimum Depth of Flow: 1 ft.
  - Typical Uses
    - Passengers, Exploration, Ferries, River Guiding, Military, Fishing, Travel
  - Availability: In Southwest
  - Use on Arizona Rivers
    - Actual Historical (Colorado)

Historical Boat Types

- Inflatables
  - 1837: First rubber boat invented
  - 1842: Fremont uses Day raft for Platte River survey
  - 1846: Horace Day patents rubber raft
  - 1851: Goodyear rubber pontoon
  - 1853: Whipple crosses Colorado in inflatable raft
  - 1866: Atlantic Ocean crossing in inflatable raft
  - 1900: Durability of rubber improved
  - 1937: First Grand Canyon inflatable trip

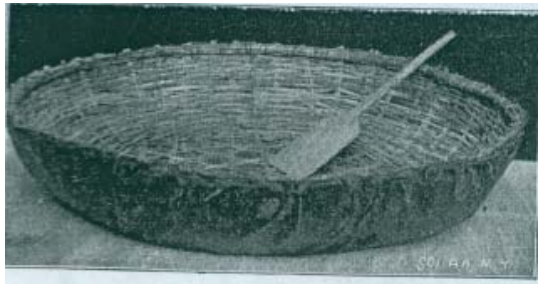
Native American Boating

- Yuman Tribes, Gila & Colorado Rivers
  - Fishing, Ferrying
  - Rafts made from Tule bundles
  - Unshaped logs (Maricopas)
  - Catamarans (for high water)
  - Hand paddled or poled
- Halchidhoma, Mohave
  - Clay Pots

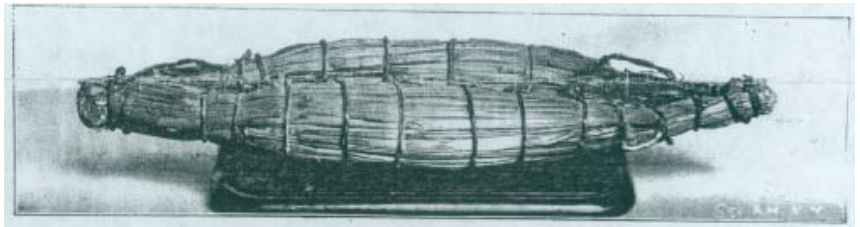
Source: Yuman Tribes of the Gila River, 1970

Native American Boating

- Interior Tribes
  - Limited record of boating
  - Apaches – wicker baskets
  - Canoe in Hohokam canal (F. Cushing)
- Tohono Mythology
  - Montezuma & the Flood – Canoe story



SKIN-COVERED, BASKET CORACLE.



RAFT CONSISTING OF BUNDLES OF RUSHES LASHED TOGETHER.

Native American Boating

- Disposable Canoes & Boats
  - Bark or Skin over wood frames
  - Used short term & abandoned
  - Willow basket boats waterproofed with sap
  - Rafts made from reeds or agave stalks
  - Poorly preserved

Sources:

- The Bark Canoes & Skin Boats of North America, 1938
- Crossing the River: Ferries & Other Small Boats in Arizona, 1999

Native American Boating

- Reasons for Limited Record of Boating
  - Boat materials not well preserved
  - Alternative modes more suitable
  - Superstitions about rivers

"The present day Indians, the Navajos and the Utes, probably owing to old superstitions and legends, have not navigated these rivers in boats and do not now navigate them except to cross at fords" p. 25-26
Report of Utah Special Master

"W.E. Medenhall: "We could never get Navajo Indians to go down with us into the canyon. They hear the rocks rolling down there and they say it is the Great Spirit…The Indians seem to believe the canyons are inhabited by spirits…Their tradition is that they fought the Cliff-dwellers and defeated them repeatedly…and rather than be captured the Cliff-dwellers jumped into the River and were turned into what is called the hump-backed fish and that reason has kept them from ever eating or catching a fish" p. 26
Report of Utah Special Master

Why Weren't There More Boating Accounts on AZ Streams?

- The Basic Paradox:
  - When the rivers had the water, Arizona didn't have the population.

Arizona Population by Decade (US Census Bureau)		
1870	9,658	0.08 /sq. mile
1880	40,440	0.4 /sq. mile
1890	88,243	0.8 /sq. mile
1900	122,931	1.1 /sq. mile
1910	204,354	1.8 /sq. mile
2011	6,482,505	57 /sq. mile

* Arizona is currently the 33rd least densely populated state. (#1 – NJ – 1,210/mi2)

Why Weren't There More Boating Accounts on AZ Streams?

- The Basic Paradox:
  - When the rivers had the water, Arizona didn't have the population.
  - When Arizona had the population, the rivers no longer had the water.

Why Weren't There More Boating Accounts on AZ Streams?

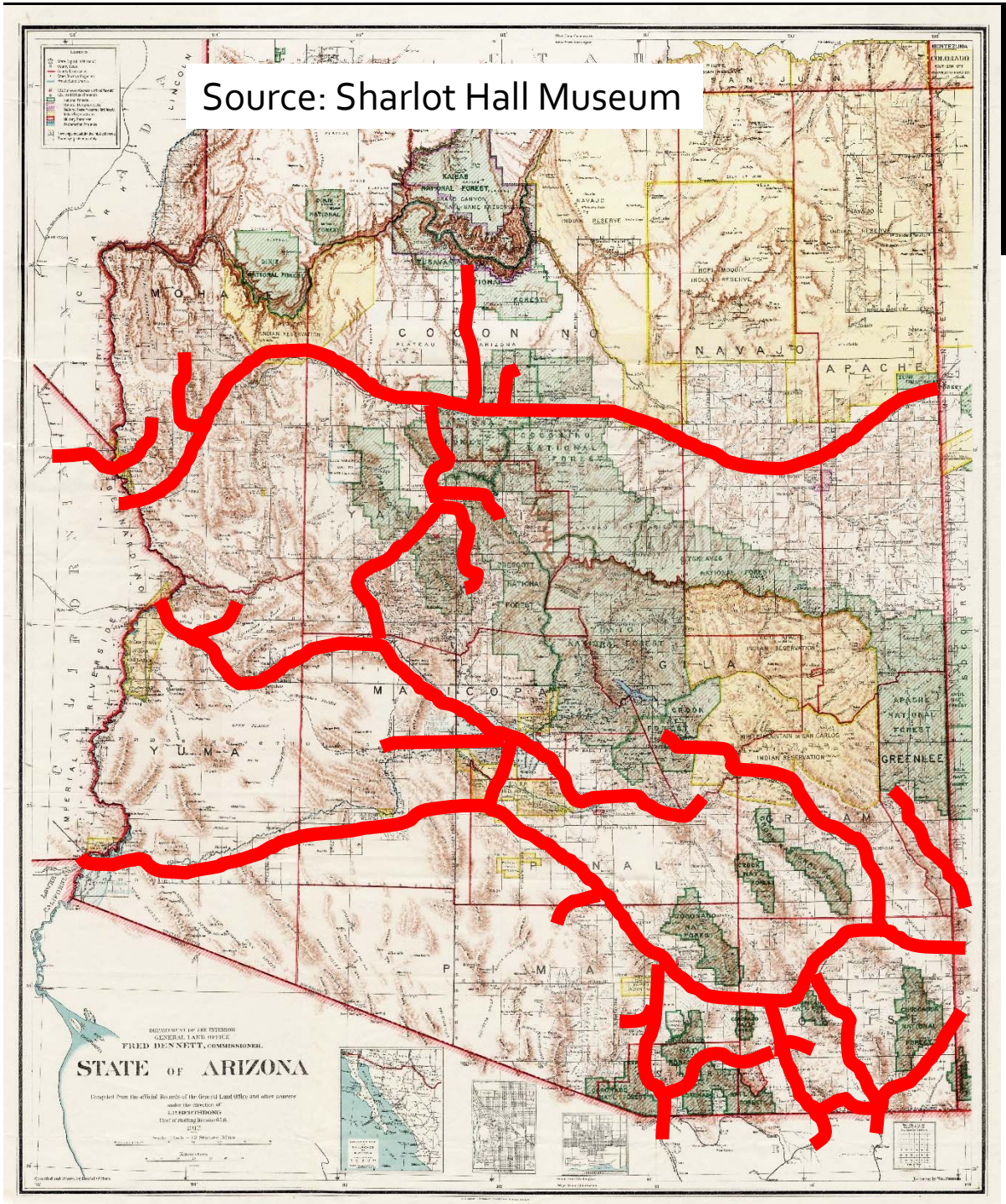
- Boating may not have been newsworthy
  - Only unusual or extraordinary trips were "news"
  - In 1871, when the railroad arrived, there were < 10,000 English readers in the entire state.
- There may be more published boating accounts
- River Boating Requires
  - Specialized equipment
  - Specialized skills

Why Weren't There More Boating Accounts on AZ Streams?

- Other Reasons:
  - Many early AZ population centers weren't on the "wet" rivers
    - Prescott, Tucson, Tombstone, Wickenberg, Flagstaff, Forts
  - Modern Transportation Routes not on Rivers
    - Except parts of Gila
      - Which was in Mexico until 1853
      - Apache threat until 1886
    - Verde aligned North-South, Travel routes primarily East-West

Why Weren't There More Boating Accounts on AZ Streams?

- Other Reasons:
  - Alternatives Available
    - Railroads (1870's)
    - Roads: Wagon & Horseback (1500's)
    - Roads: Automobiles (1900's)
    - Alternative modes required to get into & out of Arizona



AZ Railroads ca. 1912

Arizona City Populations, 1910

Bisbee (9,019)
Clifton/Morenci (9,884)
Douglas (6,437)
Flagstaff (1,633)
Globe/Miami (8,473)
Jerome (2,393)
Mesa (3,330) .....**Salt R.**
Nogales (3,514)
Phoenix (11,134) .....**Salt R**.
Prescott (5,093)
Maricopa (1,473)
Safford/Thatcher (3,490) ..**Gila R**.
Tempe (3,073) .....**Salt R**.
Tombstone (1, 582)
Tucson (13,193)
Winslow (2,381)
Yuma (2,914) .....**Colorado R**.

Why Weren't There More Boating Accounts on AZ Streams?

- Some Segments of Arizona Rivers
  - Not conducive to carrying major tonnage (e.g., ore)
  - Not easy to travel upstream (possible, but hard work)
- Rivers were diverted & dammed before Statehood

Reasons Why Not to Boat a Navigable River

- Faulty Logic: If the river was navigable, people would have regularly boated it.

- Many Factors Involved:
  - Flow depth
  - Need
  - Cost
  - Speed of Travel
  - Skills
  - Location

Reasons Why Not to Boat a Navigable River

- You don't own a boat
- You don't know how to build a boat
- There are no materials to build a boat
- It takes too long to build a boat
- You don't know how to pilot a boat
- You already own a wagon, car, horse, etc.
- Wagon, horse, railroad etc. are faster
- It's too cold. Or hot. Or rainy. Or windy….
- You are afraid of boating
- You can't swim

Reasons Why Not to Boat a Navigable River

- The river doesn't go where you want to go
- The boat won't carry want you want to carry
- You need a car, horse, etc. when you get there
- Going upstream is too much work or expense
- You can't risk capsizing
- The river was remote – no access in 1912
- You don't live/work near the river
- The river is unexplored, unknown
- You don't need to go anywhere.
  - Self-sustained communities
- Someone built a dam or removed all the water

Trains vs. Boats

- Advantages of Trains over Boats, 1912
  - Faster
    - Steamboat: 240 miles/12 days
    - Steam Engine: 20-50 miles/hour
  - Carry more cargo
    - Steamboat: 50 tons
    - Train: 50 tons/ore car
  - Moves 24 hrs/day
  - Go uphill, onto & through mountains
  - Not affected by weather, drought, flood

- Why are railroads located along rivers?
  - Flat terrain

Floating Logs as Navigability

- Requires:
  - River located in forest (source of logs)
  - Population (market for logs)
  - River located in market (delivery point)
  - Sufficient river flow to float logs
  - Wide & straight enough river to prevent log jams
- Some accounts of log-floating in AZ

Historical Boating: Summary

- Instances of Historical Boating
  - Gila, Salt & Verde River
  - Throughout the year, during ordinary conditions
- Primarily
  - Low Draft Boats
  - Downstream Travel
- **NOTE**: Actual ***historical boating is not required*** to demonstrate title navigability. Only ***susceptibility*** to boating is required.

What Type of Boat is Required?

- Federal Standard for Boat Type for Navigability
  - US v. Holt (1926) "…navigability does not depend on the particular mode in which such use is or may be had - whether by steamboats, sailing vessels or flatboats…but in the fact…that the stream in its natural and ordinary condition affords a channel for useful commerce"
  - No required type of boat.

Susceptibility to Trade & Travel

- It's All About Flow Depth & Obstructions
  - Requirements vary with the type of boat
  - Width generally not a limiting factor
- Navigability Requirements
  - Not susceptible to every type of boat
  - Long enough stream segment
  - Minor obstacles not important
  - Some difficulty not important

Boating Requirements

- Federal Minimum Standards for Boating

Table 8-1 Minimum Required Stream Width and Depth for Recreation Craft		
Type of Craft	Depth (ft.)	Width (ft.)
Canoe, Kayak	0.5	4
Raft, Drift Boat, Row Boat	1.0	6
Power Boat	3.0	6
Source: US Fish and Wildlife, 1978 (as cited in ASLD, 2003)		

Boating Requirements

- State Standards for Boating
  - Arizona:
    - Presumptions of Non-Navigability Struck Down by Arizona Court ➔ Particularized Assessment
  - Alaska:
    - Criterion Craft – Inflatable raft + 1500 lbs
  - Washington:
    - Depth Classification (Probably Not, Maybe, Probably)
  - Oregon:
    - Floating logs – Clear Channel
    - Dugout canoes

Obstructions & Obstacles

- Obstructions to Navigability
  - Discussed in Boating Presentation
  - Depends on the Type of Boat
    - River Barges vs. Trapper Canoes
  - Depends on Boater's Experience
  - Depends on Flow Rate
  - Obstruction ≠ Obstacle, Challenge

Obstructions & Obstacles

Obstruction?	Barges	Canoes
Rapids	Yes	No (I-V)
Beaver Dams	No	No
Waterfalls	Yes	Some
Sand Bars	Only if river wide	No
Strainers / Sweepers	No	No
Marshes	Yes, if no clear channel	If shallow
Braiding	No, unless shallow	No
Shallow Flow	< 10 ft.	< 0.5 ft.
On Gila, Salt & Verde Rivers, continuous, regular shallow flow is the only real obstruction to boating		

Obstructions & Obstacles

- Rapids
  - Defined as: A section of a river where there is an increase in water velocity & turbulence.
  - Some rapids (not all):
    - Slope increase
    - Shallow or exposed rocks
    - Whitewater
  - Most rapids are obstacles, not obstructions
    - Depends on boat type, suitability for rapids
    - Long, continuous, major rapids could be obstruction
  - International Rating Scale for Rapids (I-VI)

Obstructions & Obstacles

- Elements of Rating Rapids
  - Ease of passage & route finding
  - Size of waves
  - Need to maneuver
  - Complexity of maneuvers, skills required
  - Danger to swimmers
  - Need for group assistance, difficulty of self-rescue
  - Need for scouting
  - Power of current
  - Length & complexity of rapid
- Can be subjective, seasonal, annual

Obstructions & Obstacles

- Rapids & Navigability in Arizona
  - Class I-V are Navigable (by definition)
    - There are very few Class III-VI rapids on the Salt, Gila, and Verde Rivers (mostly I-II)
    - The ***navigable*** Colorado River has some of the largest rapids in North America
  - Rapids are minor part of the rivers' lengths
    - Vast majority (>95%) = Class I or Pools

Obstructions & Obstacles

River	Percent of River's Length				
	Class II	Class III	Class IV	Class V	All Rapids
Gila	0.2%	0.03%	0	0	0.2%
Salt	1.8%	2.7%	0.3%	0	4.8%
Lower Salt	0	0	0	0	0

Obstructions & Obstacles

- International Scale - Rapids Classification
  - Class I: Fast Moving Water **Pre-Novice**
    - Riffles, easily navigated with little training
  - Class II: Straightforward Rapids **Novice**
    - Wide, clear channels, easy with training
  - Class III: Rapids **Intermediate**
    - Boat maneuvering required
    - Moderate waves, tight channels, powerful currents

Class I Rapids in Arizona

Verde River, Unnamed Class I Rapid @ 122 cfs

- Video:
  - Y:\library\jef\photos\2014\verde river april 2014
  - Clay Bank Rapid, Verde River

Class II Rapids in Arizona

Gila River, Above Eye of the Needle, Class II Rapid @ 220 cfs

- Video:
  - X:\projects\Agency\ASLD\Navigability 2012\gila river\photos\gene #9147
  - Eye of the Needle, Gila River

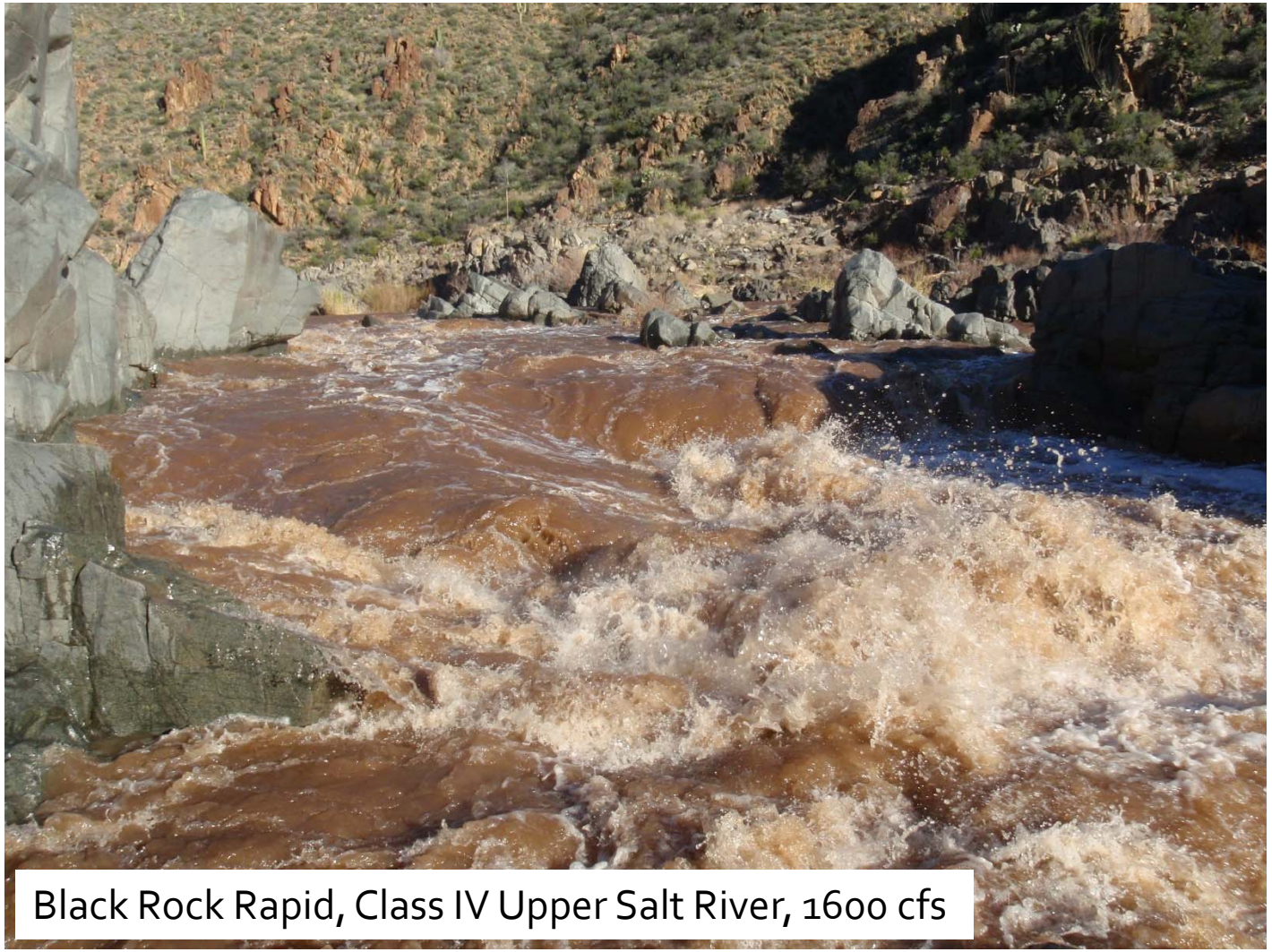
Class III Rapids in Arizona

- Add photo, AZ Streams
  - Upper Salt River
- Add Video, Class III

Obstructions & Obstacles

- International Scale of River Difficulty
  - Class IV: Rapids — **Advanced**
    - Powerful, intense, predictable rapids
    - Moderate to high risk if capsized
  - Class V: Rapids — **Expert**
    - Complex, violent, demanding
    - High risk, difficult rescue
  - Class VI: Obstacles — Extreme
    - Unrunnable for most boaters

Class IV Rapids in Arizona



Black Rock Rapid, Class IV Upper Salt River, 1600 cfs

Class IV Rapids in Arizona

- Add video
  - Upper Salt River
  - C:\jon\upper salt 2013\March 14 2013 #3145492

Black Rock Rapid, Class IV Upper Salt River, 1600 cfs

Class V Rapids in Arizona

- No Class V or VI Rapids on:
  - Salt River
  - Gila River
  - Verde River
- Only Class V Rapids in Arizona:
  - Colorado River:* Navigable
  - Small Rivers: East Verde, Burro Creek

*Grand Canyon rapids are rated on a 1-10 scale

Obstructions & Obstacles

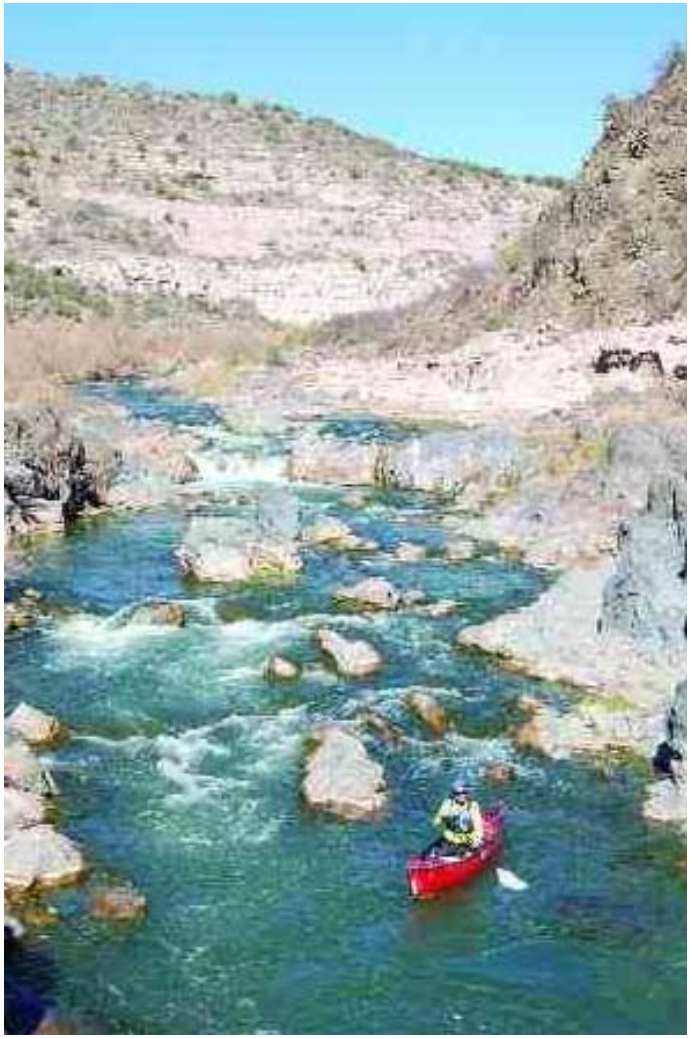
- Beaver Dams
  - Not on major river main channels
    - Small river feature
    - Wiped out by season high flow
  - Not necessarily dams
    - Bank dens or lodges
  - Not obstructions to small boats
    - Obstacle at dam itself (sluice or carry)
    - Raises water depths upstream of dams

Obstructions & Obstacles

Mid-channel beaver lodge on the Gila River, Segment 7, February 2003

Obstructions & Obstacles

- Waterfalls
  - There are none on the Gila, Salt, Verde
  - Verde "Falls" is a rapid (Class III-IV) & is often run by canoes, kayaks & rafts



Obstructions & Obstacles

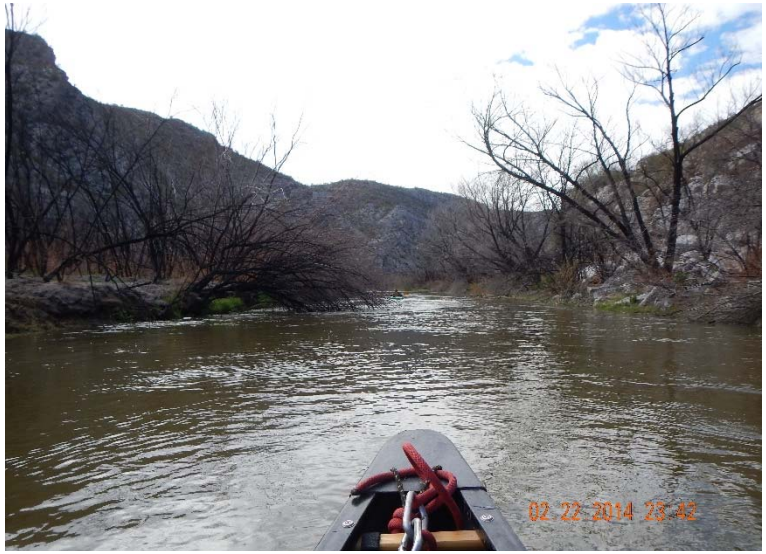
- Sand Bars
  - Occur on all major rivers.
    - Colorado & Mississippi.
    - Do not preclude navigability
  - Obstacle at low flow
  - Boats go around sand bars

Gila River, Segment 1, 39 cfs

Obstructions & Obstacles

- Strainers & Sweepers
  - Fallen trees in channel
  - Overhanging bank vegetation
  - Removed by Floods, Time
    - Worse after dams built
  - Hazardous to Unprepared
  - = Obstacle
    - Easily removed
    - Easily avoided


Gila River, Segment 4, 220 cfs



Obstructions & Obstacles

- Boating around Obstacles
  - Avoid the obstacle – just go around it
  - Lining, Scooting, Dragging
  - Depends on
    - Skill of boater
    - Knowledge of river

Obstructions & Obstacles

- Portaging
  - Carrying the boat over land
  - Short Hauls
  - Long Hauls
  - Around non-navigable segment
    - Then back to navigating the river
  - Trapper Routes
- Deciding to portage, line or run an obstacle
  - Weather, Consequence, Fatigue, Skill, durability of craft

Obstructions & Obstacles

- First Descent Obstruction = 2nd Trip Obstacle
  - John Wesley Powell
    - Lined and portaged 62 of 476 rapids
    - Damaged & sunk several boats
  - 2013 Replica Trip
    - Same boats, more skill & knowledge
    - Portaged one rapid (to replicate)
    - Ran the rest

Obstructions & Obstacles

- Not Obstructions
  - Remoteness
    - In 1912, the State of Arizona was remote.
  - Deep Canyons
    - Canyon depth is not a river feature
  - Narrow Rivers
    - Wide enough for a boat
  - Manmade features
    - Dam, road, mine, channelization, fences
- Obstacles are Not Obstructions to Navigability
  - US v. Holt (1926) "…nor on an absence of occasional difficulties…"

Modern Recreational Boating

- Montana PPL v. Montana Criteria
  - Modern watercraft are meaningfully similar to those in customary use at time of statehood.
    - Can modern boats go where historical boats couldn't?
  - River's post-statehood condition is not materially different from statehood physical condition.
    - Has the river changed to substantially improve boating?
    - Less torrential in high flow periods?
    - Less shallow in low flow periods?

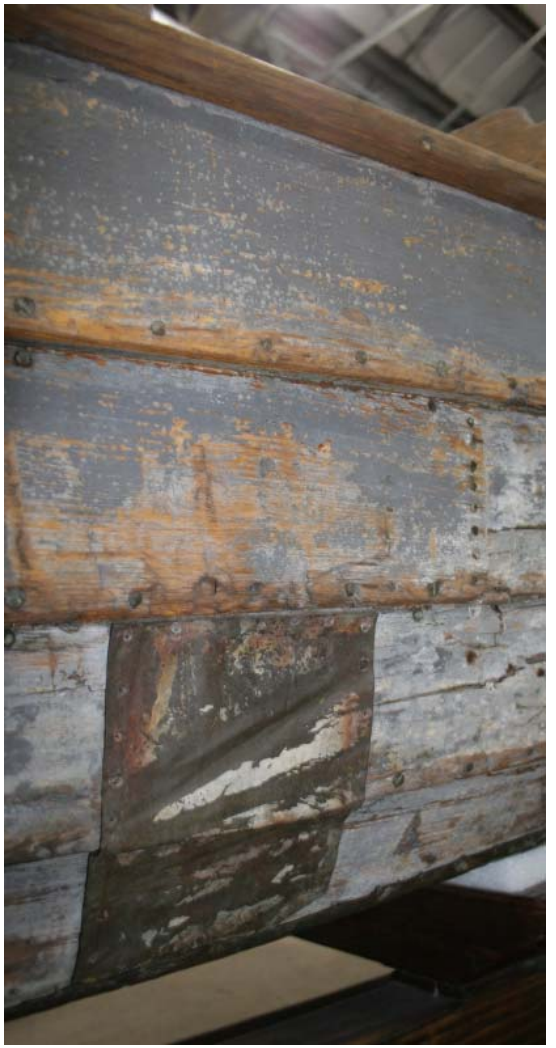
Modern Recreational Boating

- Meaningfully Similar to Historical Boats?
  - Draw is the same (canoes, flatboats, rowboats)
    - Same depth needed
  - Design is essentially the same
    - Some performance improvements
  - Durability is improved (plastic, hypalon, etc.)
    - Less skill needed
  - Low durability was an expectation
    - Repair – canvas, wood
    - Extra care & time in selecting route

Modern Recreational Boating

Emery Kolb repairing the Edith, Christmas 1911, in Grand Canyon

Durability & expectations differ.



Modern Recreational Boating

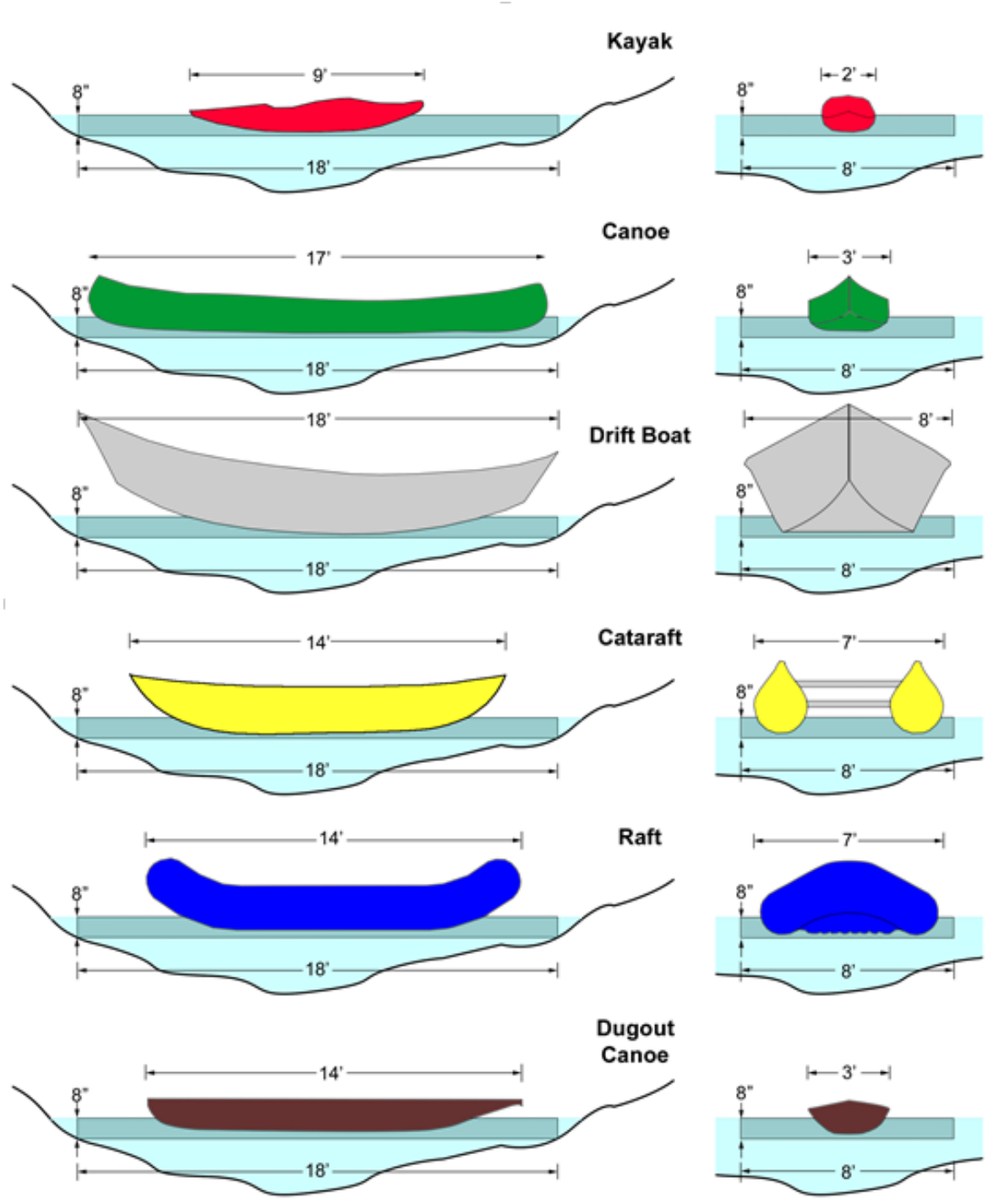
- Meaningfully Similar to Historical Boats?

Modern Recreational Boating

Historical & Modern Boat Flow Depth Requirements		
Boat Type	**Required Depth**	**Source**
Modern Canoe	0.3-0.5 ft	USFWS, Slingluff, Cortell
Canvas Canoe	0.2 ft	1910 Sears Catalog, Hunter/Trapper
Drift Boat	1.0 ft	Cortell
Duck Boat	0.2 ft	1910 Sears Catalog
Kayak	0.15-0.5 ft	Brosius, USFWS
Rowboat	1.0 ft	USFWS

As reported in Stantec (Tellman), 2005

Historical v. Modern Boats



Similar Depths Needed for Historical Boats & Modern Recreational Boats

Source: Shelby, Whittaker & Donahue, 2011

Modern Recreational Boating

- Demonstrates Susceptibility
  - Can be boated given opportunity, time & motive
- Is Travel ("travel on water"…Daniel Ball test)
- Recreation is Commercial
  - Commercial river touring existed in 1912
  - Tourism-based economies
  - Boat rental, supplies, guiding, outfitting

"The Government's assertion as to lack of commercial possibilities fails to recognize one source of commerce which in the future will undoubtedly develop to a considerable extent-the use of these Rivers for the transportation of tourists for hire, to view the natural scenic wonders and explore the archaeological features of these regions"

Utah Special Masters Report, p. 117).

Modern Recreational Boating

- In Arizona
  - Federal monitoring & regulation
  - Commercial outfitters
  - Published river guidebooks
  - Boat rentals
  - Websites
  - Paddling clubs
  - Boat races & events
  - Shuttle services

Modern Recreational Boating

- Commonly Boated In Arizona
  - Gila Box (Segment 2)
  - Gila Coolidge Dam to Ashurst Hayden (Segments 4-5)
  - Gila River Downstream Phoenix (Segment 7)
  - Salt River Canyon (Segment 2-4)
  - Salt River Segment 5
  - Verde River (all)
  - Colorado, San Francisco, Virgin, Little Colorado, Black, Bill Williams

Modern Recreational Boating

- Summary – Modern Boating Occurs:
  - Wherever river flow has not been altered
  - Wherever public access is not prevented
  - Most often in scenic or exciting river reaches
  - Year-round & seasonally, depending on flow rates