

**Arizona Pavements/Materials
Conference
November 15, 2011**

***History
of
Arizona's Transportation System***

**Arizona State University
Memorial Union**

Richard L. Powers, P.E.

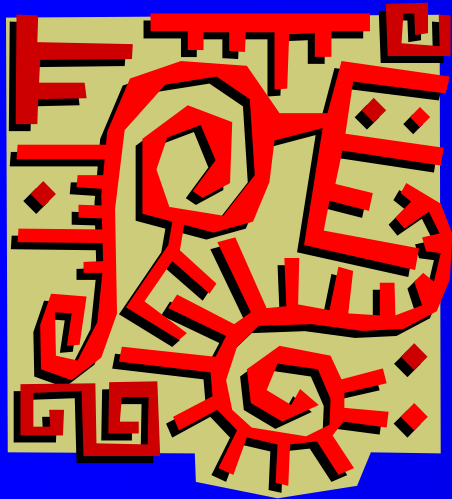
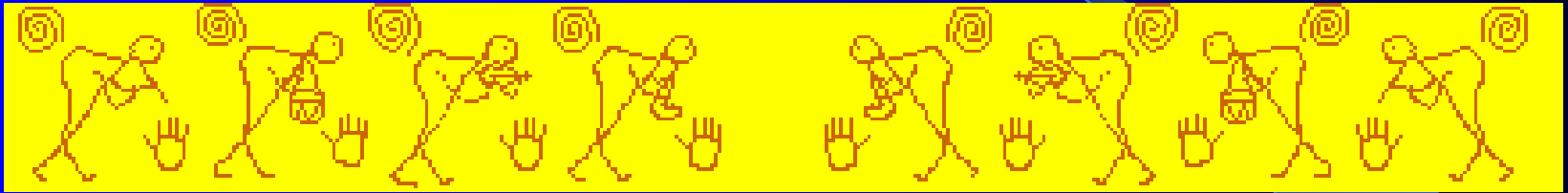
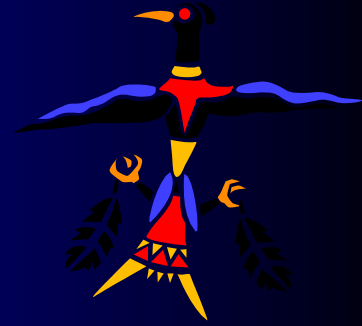
Foot trails

to

Superhighways



Arizona – Transportation Ancient Footpaths



Ancient Trails

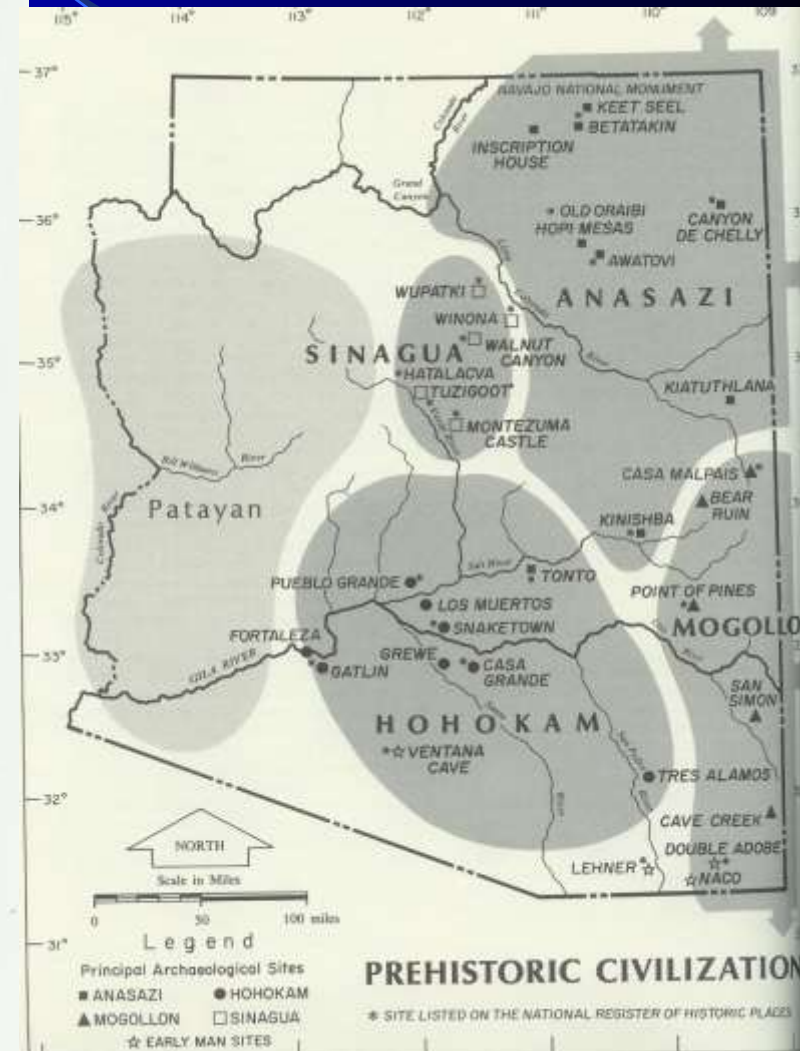
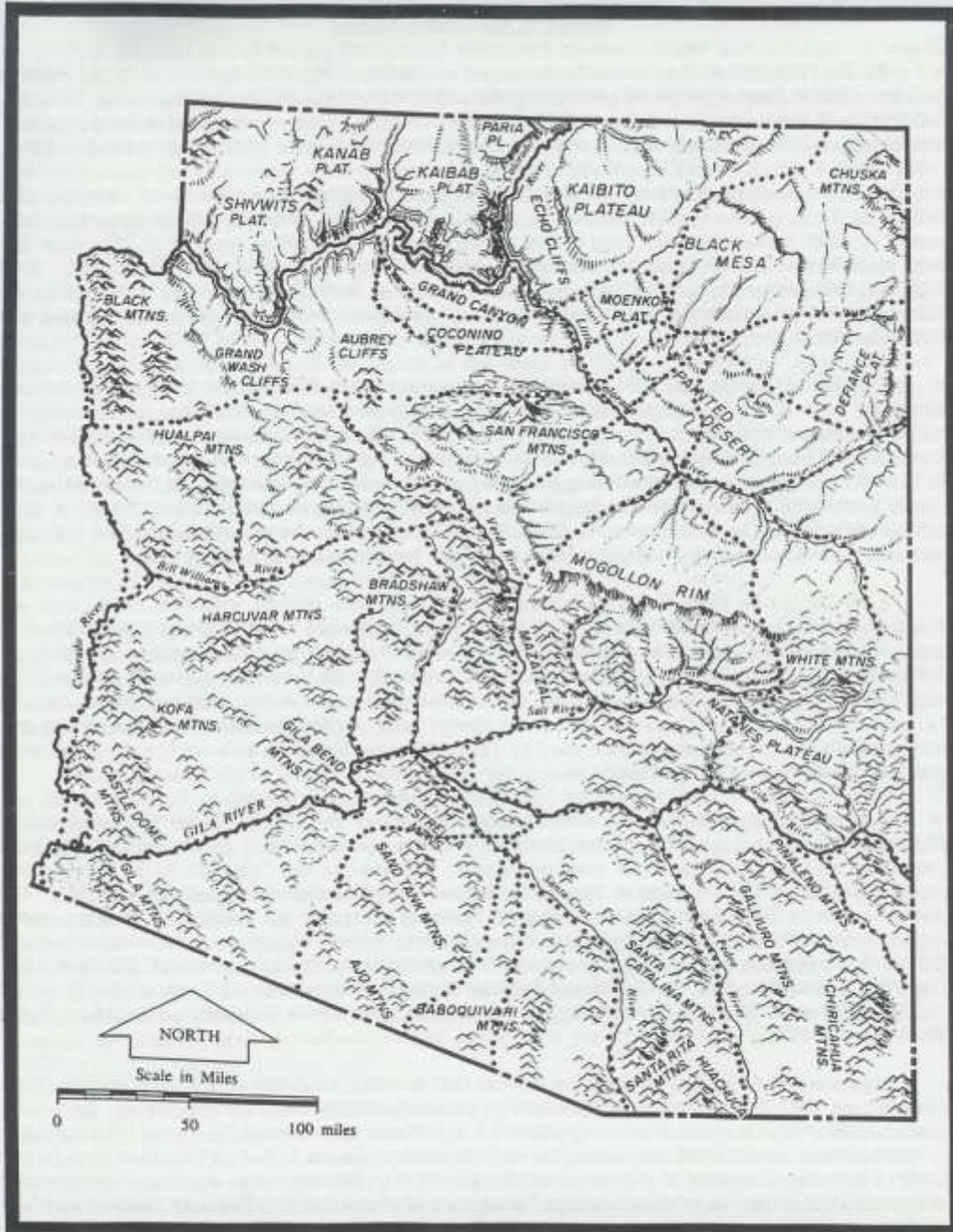


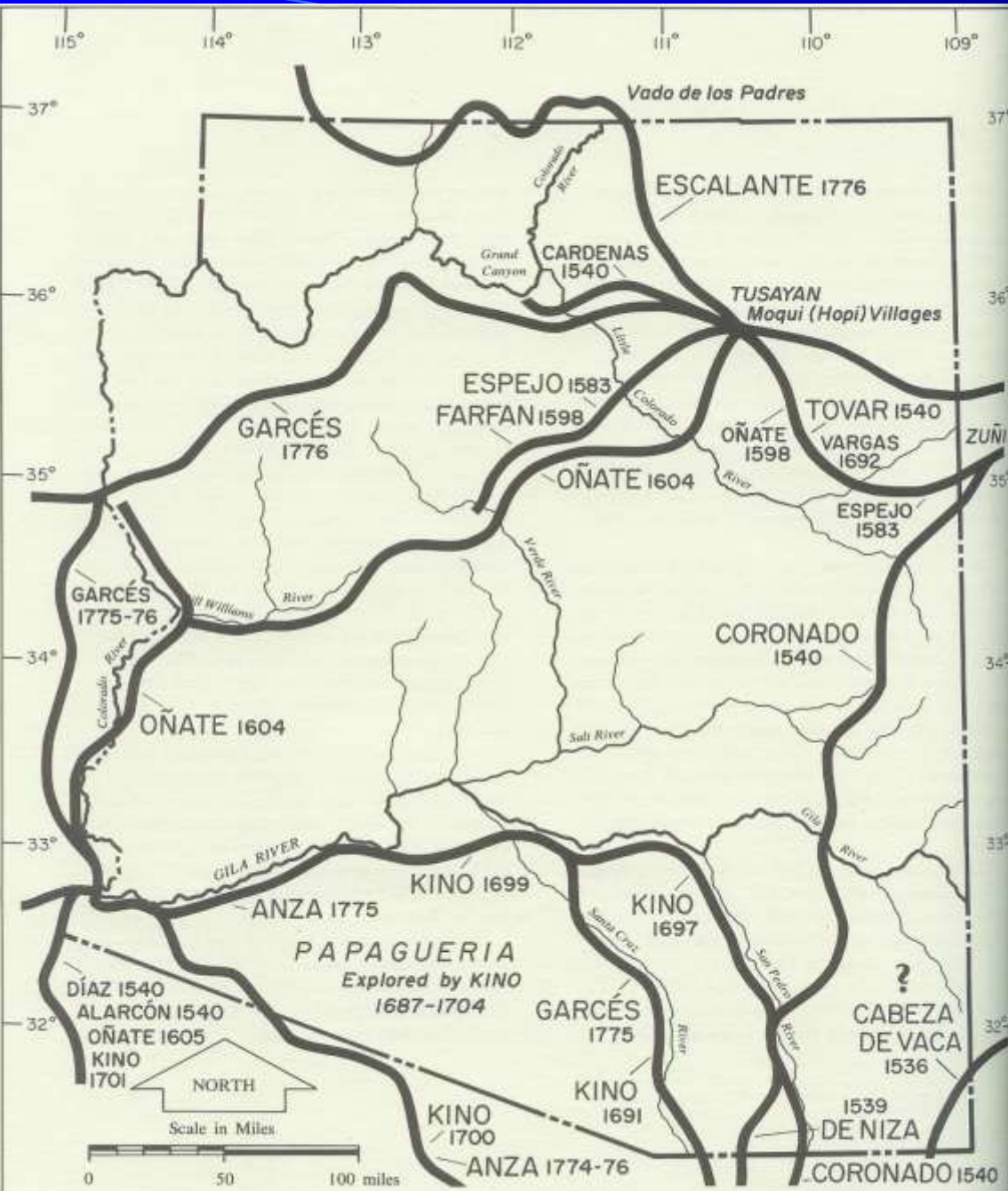
Figure 1. Some of the major Native American trails used in Prehistoric and Historic times (Base map: Walker and Bufkin 1986).

PREHISTORIC CIVILIZATION

Legend
 ■ ANASAZI ● HOHOKAM
 ▲ MOGOLLON □ SINAGUA
 ☆ EARLY MAN SITES

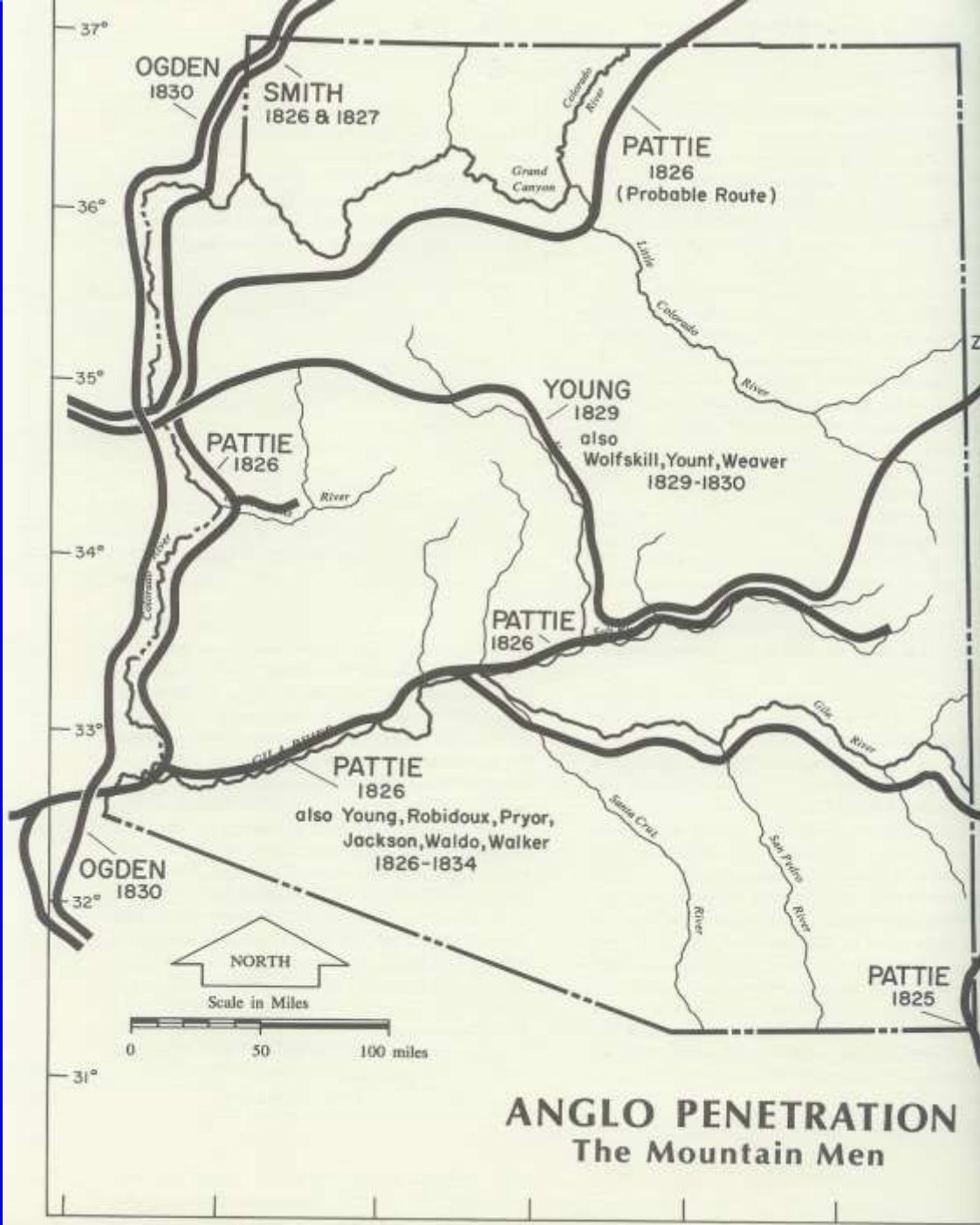
* SITE LISTED ON THE NATIONAL REGISTER OF HISTORIC PLACES

Spanish Explorer Routes 1520 - 1776

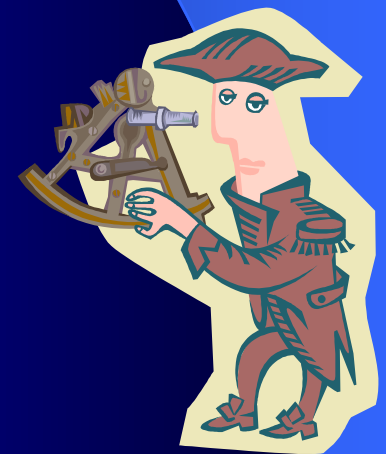
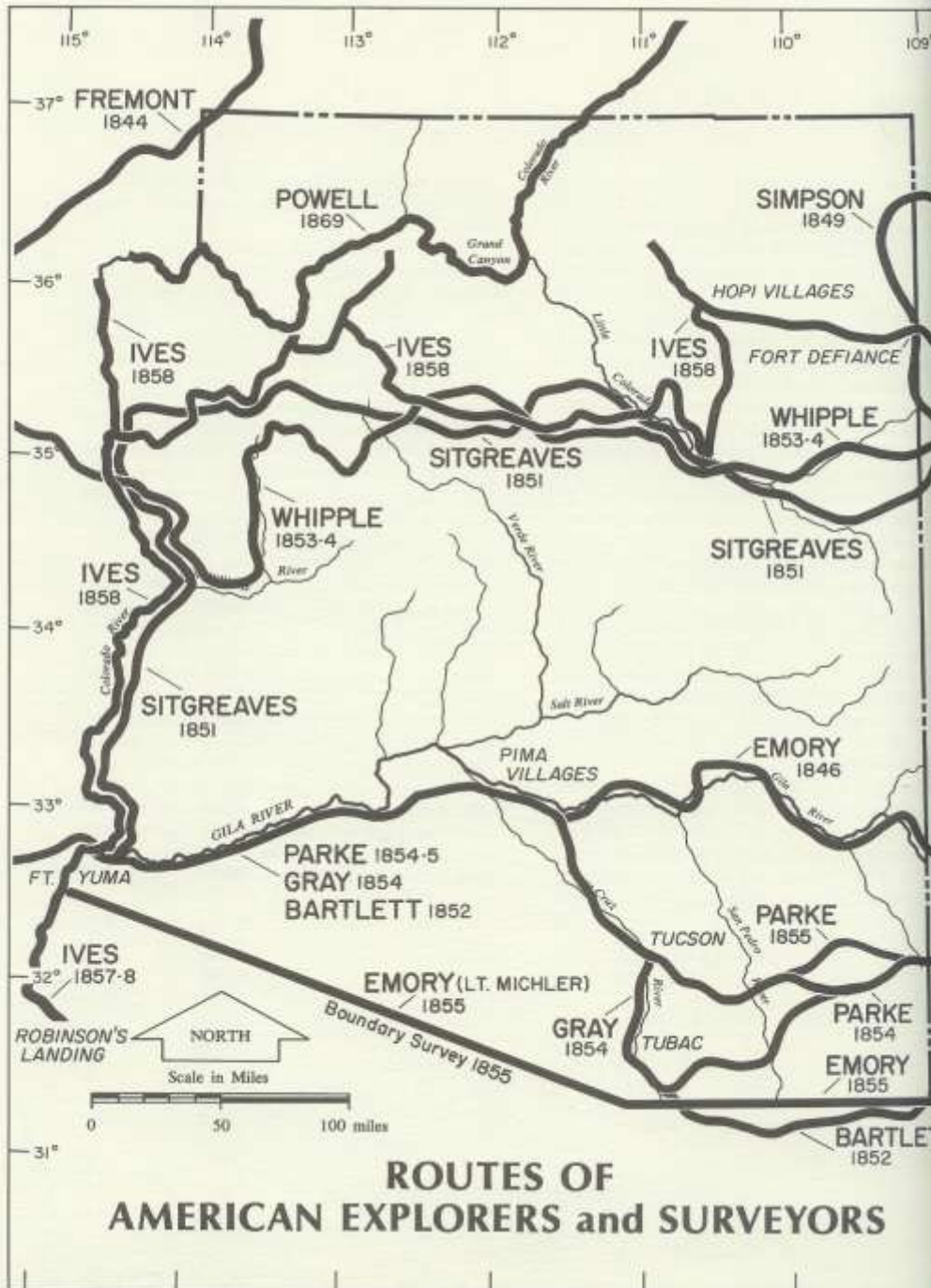


ROUTES OF SPANISH EXPLORERS

Mountain Men Trails 1825 - 1834



Routes of Explorers 1844 - 1858



Toll Roads in Arizona

1850's – 1890's

Senator Highway – Arizona's First Toll Road

The crown jewel of Arizona's backroads of the Bradshaw Mountains, the Senator Highway was first built between 1866 and 1867 as part of the Prescott and Lynn Creek Toll Road. The charge was **\$1.50 per wagon and fifty cents (4 "bits") for a horse and rider**. This was considered expensive in its day.

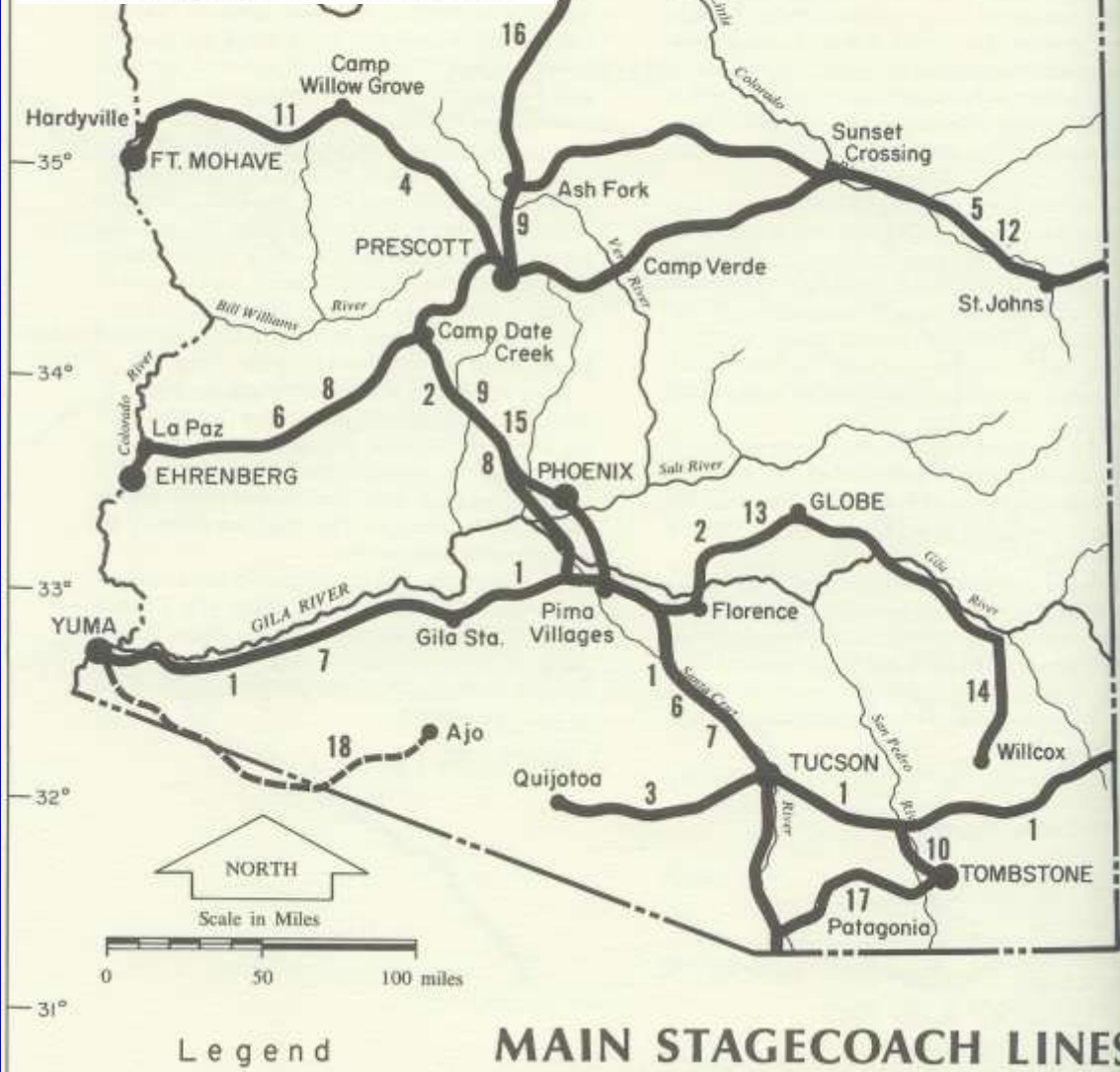
1864 - Toll roads were authorized by Territorial Legislature.

Toll Roads in the US: A Brief History

Tolls were first established in America in Colonial times, to fund early plank roads, and were employed on public facilities as early as the 1780s as a way of raising the funds to keep roads in repair. Toll road construction started a few years later, with the states granting charters or patents to private companies for turnpike construction and operation. By the 1820s thousands of miles of turnpikes had been completed;



Stage Routes Toll Roads 1840 - 1869



Military Trails 1850 - 1880

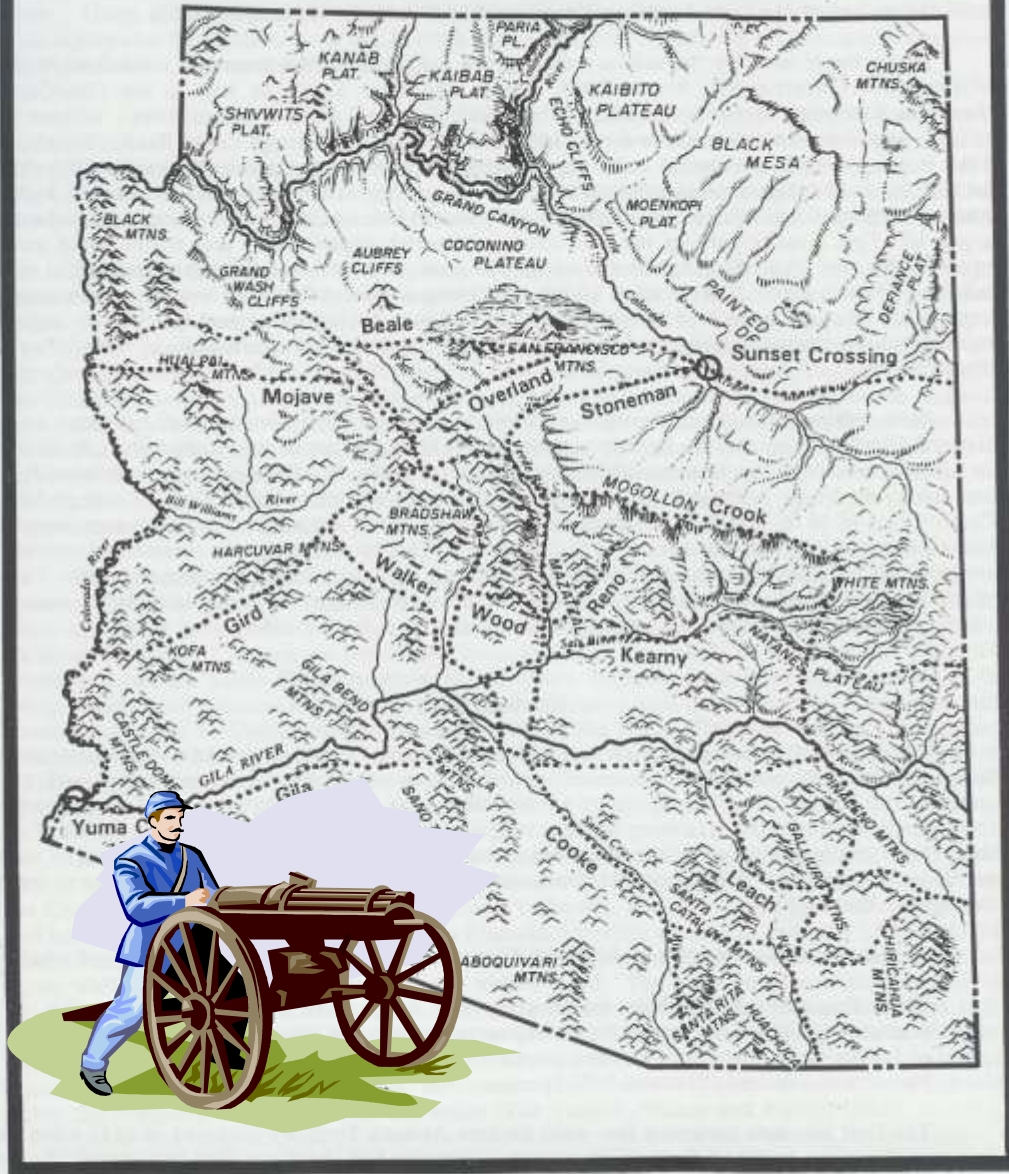


Figure 6. Routes commonly used by the Military during the Indian Wars Era (Base map: Walker and Bufkin 1986).

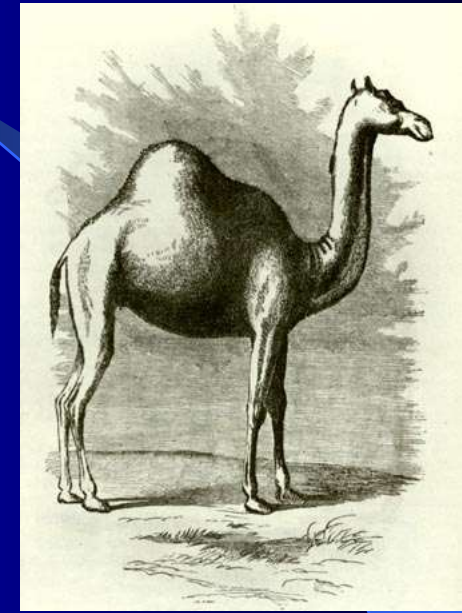
Famous Trails



From Gulf of California

From Sonora

Five pathways that brought civilization to Arizona: Santa Cruz Trail (yellow), which led explorers from Mexico to Tucson; Gila Trail (red), route of the Forty-niners and the Butterfield Stage across southern Arizona; Colorado River (blue), from the Gulf of California, north to Ehrenberg, and then overland to Prescott; Beale's Wagon Road (green), the main northern passageway across Arizona; and the Honeymoon Trail (orange), from Utah to northern and eastern Arizona.



The U.S. Camel Corps

A 1857 survey mission across northern Arizona, led by Lt. Edward Fitzgerald Beale.



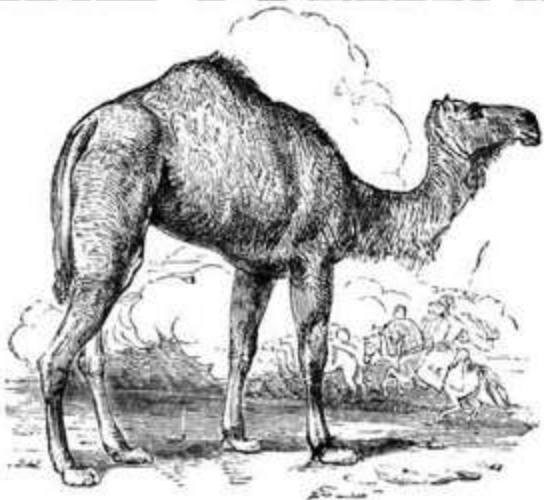
A pack train of camels in the American Southwest in the 1850s. The illustration is from Harper's Weekly.



Hi Jolly

In 1856 became one of the first camel drivers ever hired by the US Army to lead the camel corps experiment in the Southwest.

**THE CAMELS
ARE COMING!**

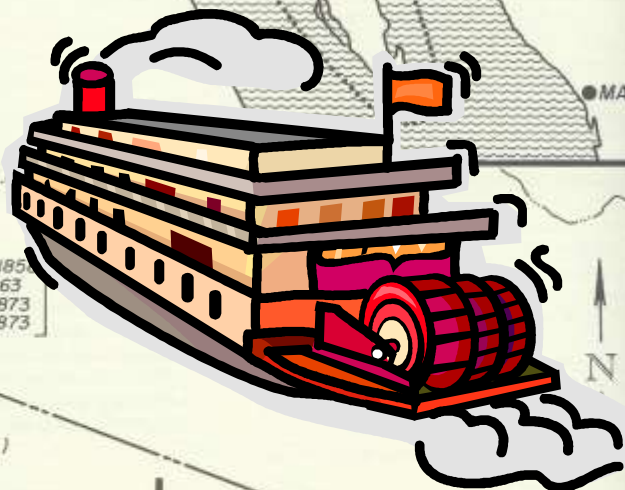
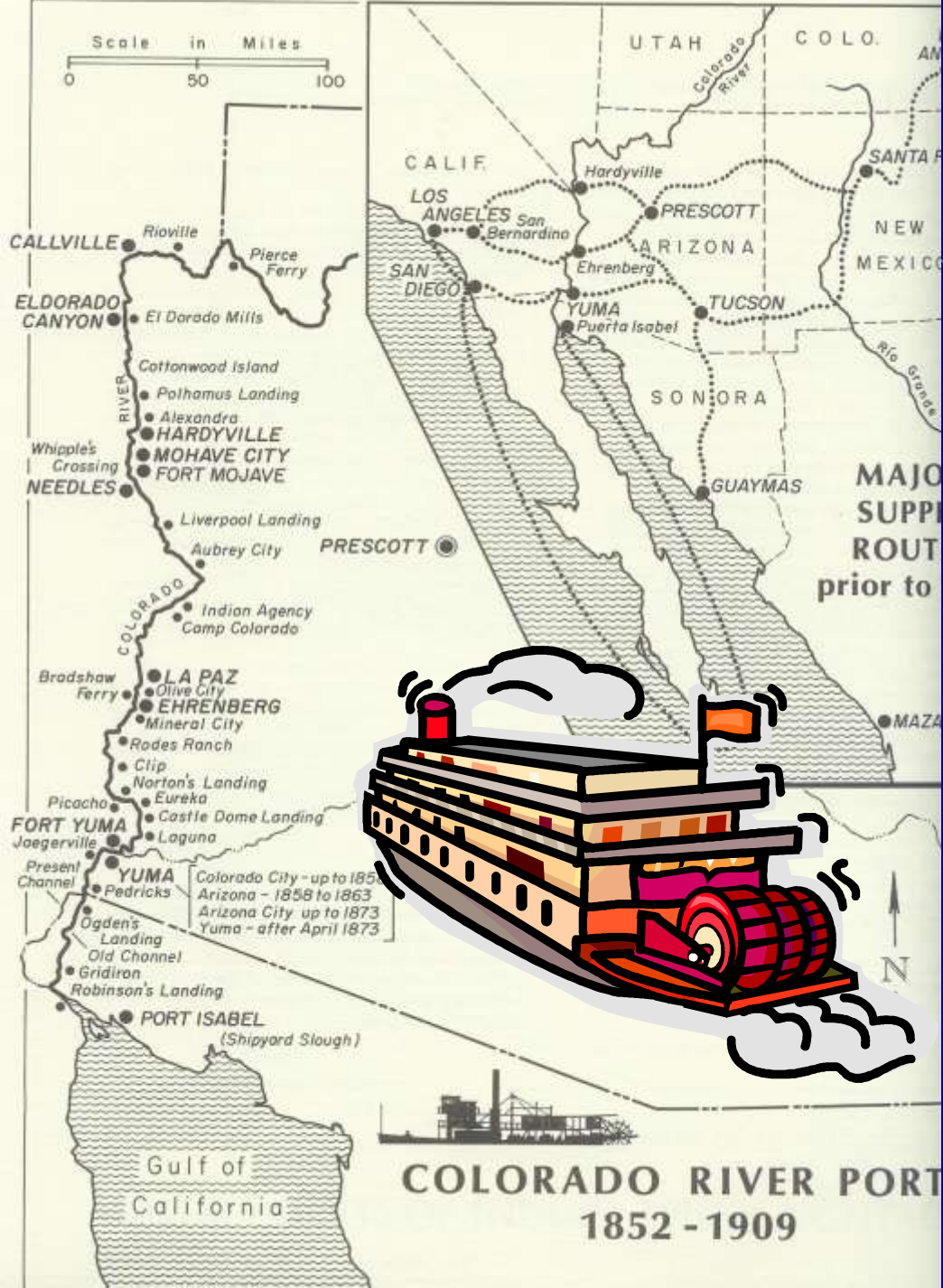


SEE THE U.S. CAMEL CORPS!



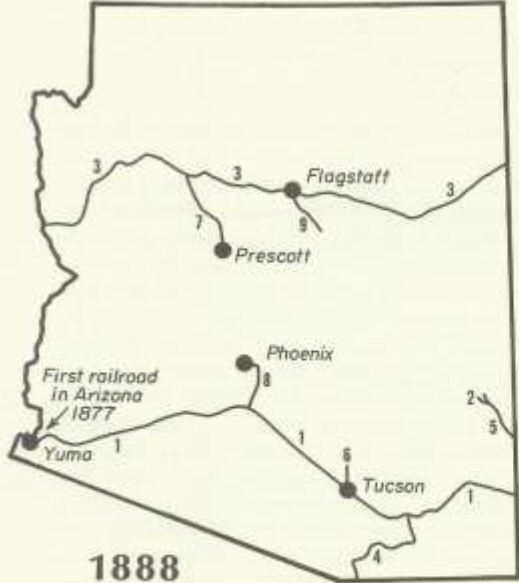
Hadji Ali grave in Quartzsite, Arizona

Arizona's River Ports & Ferry 1852 - 1909



COLORADO RIVER PORT
1852 - 1909

Arizona's Railroad Growth 1888 - 1976



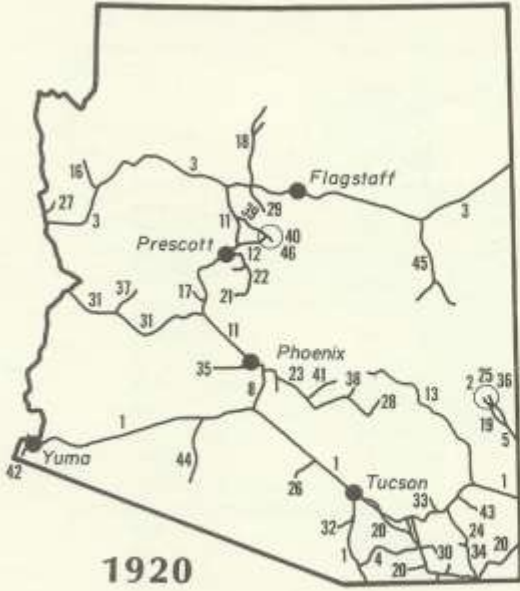
1888



1900

Refer to numbered table for key to maps

1888, 1900 & 1920 maps show existence of railroads by their initial corporate names. The 1972 map indicates current operating co

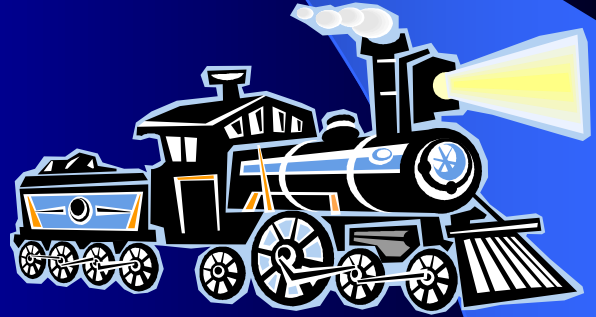


1920

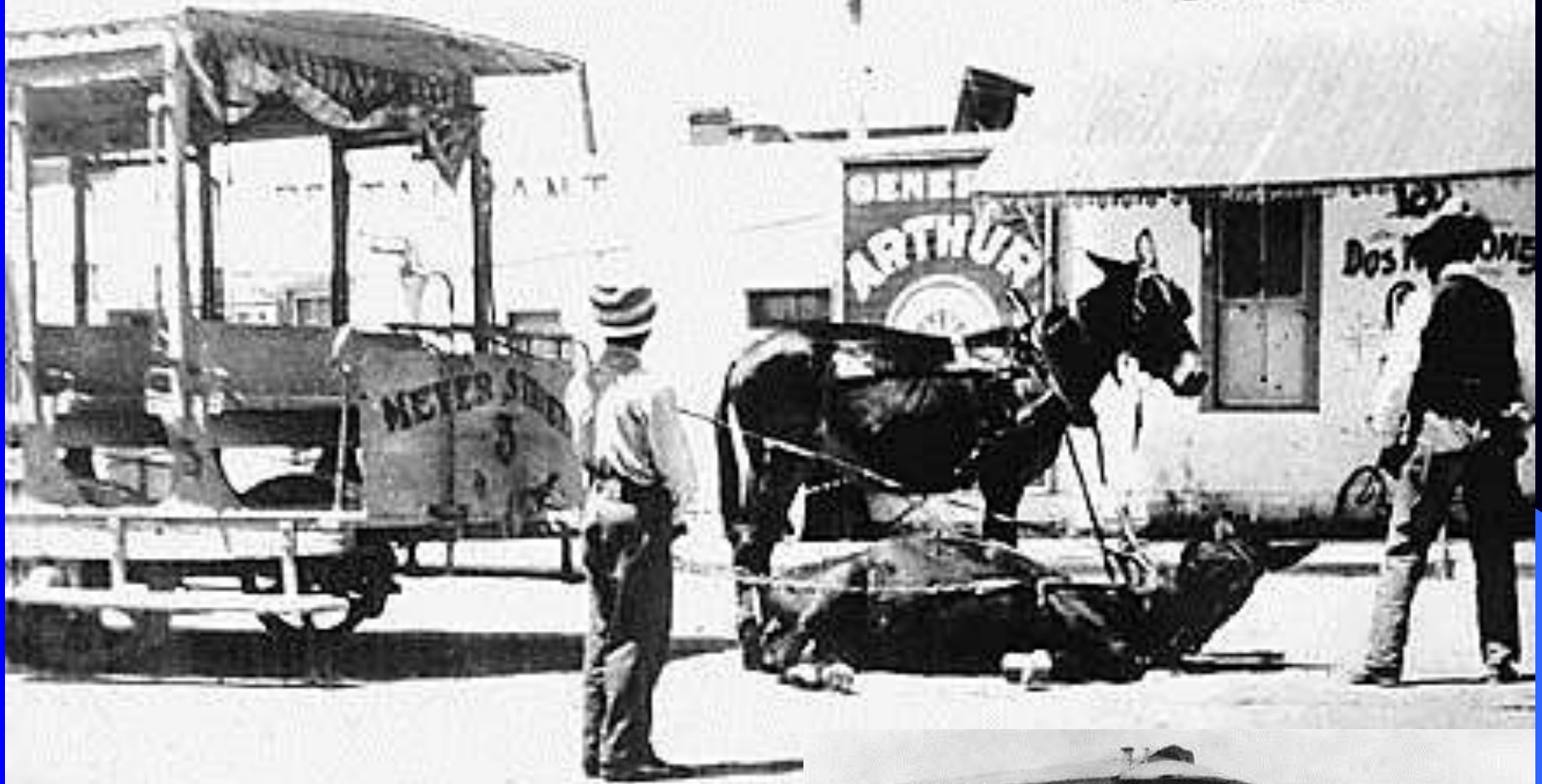


1976

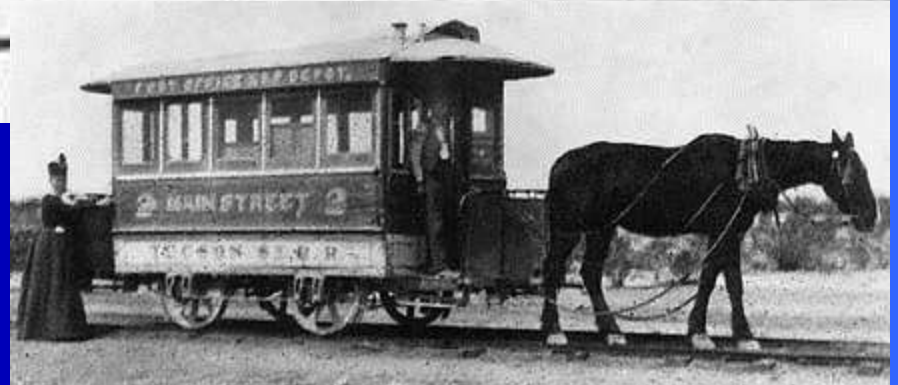
RAILROAD DEVELOPMENT



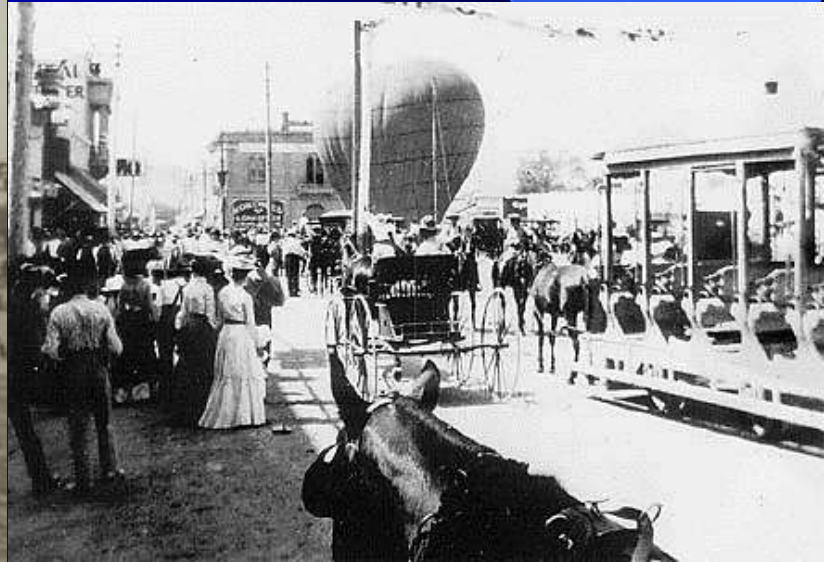
Rail Service



1898



Early Air Travel 1890's



The First Roads in Arizona



First Freight Haulers

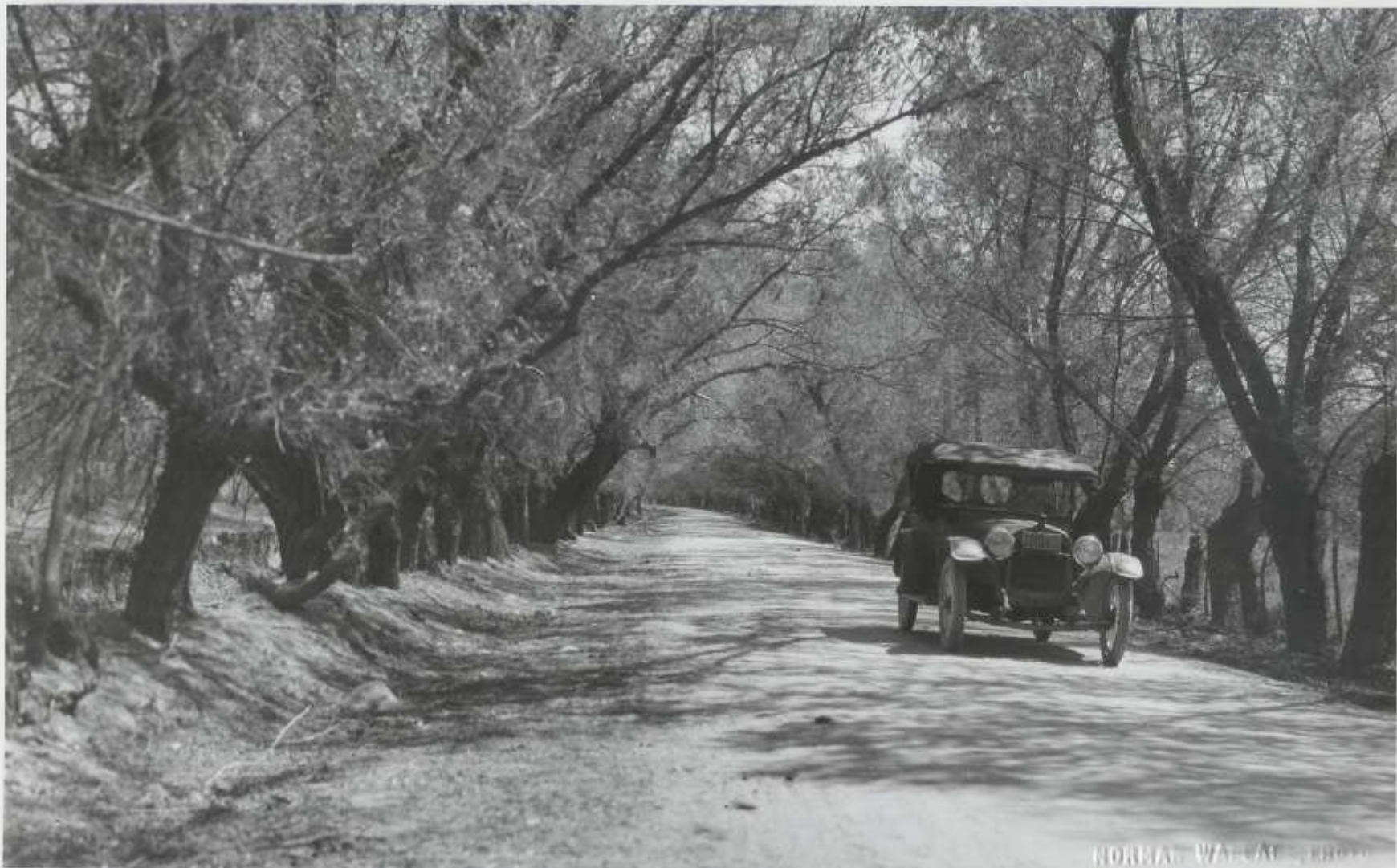


State takes Control of the Roads

Prior to 1909 - All road expenditures were made under direction of County Board of Supervisors

1909 – 1912 - March 18, 1909 Territorial road law created office of Territorial Engineer J.B. Girand, The Board of Control was established to manage expenditures – Board of Supervisors were required to levy taxes to pay for road improvements.

1912 – Arizona becomes 48th State (AHD created)



NORMA WALKER PHOTO

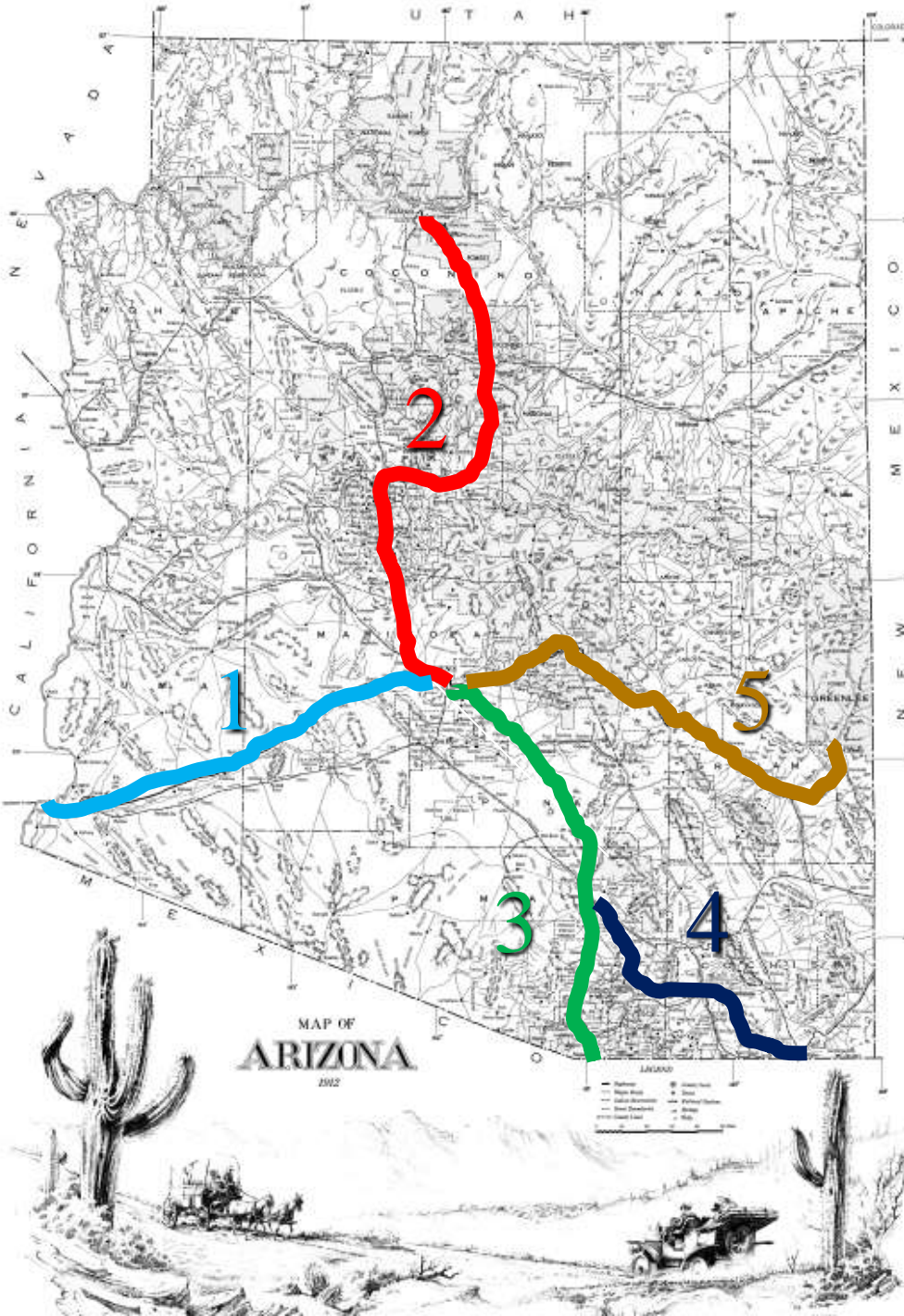
HWY. 89 - Photo 1918 - 5 miles north of NOGALES at the "WILLOWS" Hupmobile Car - Norman Wallace
Photographer

1912 State Highway Map

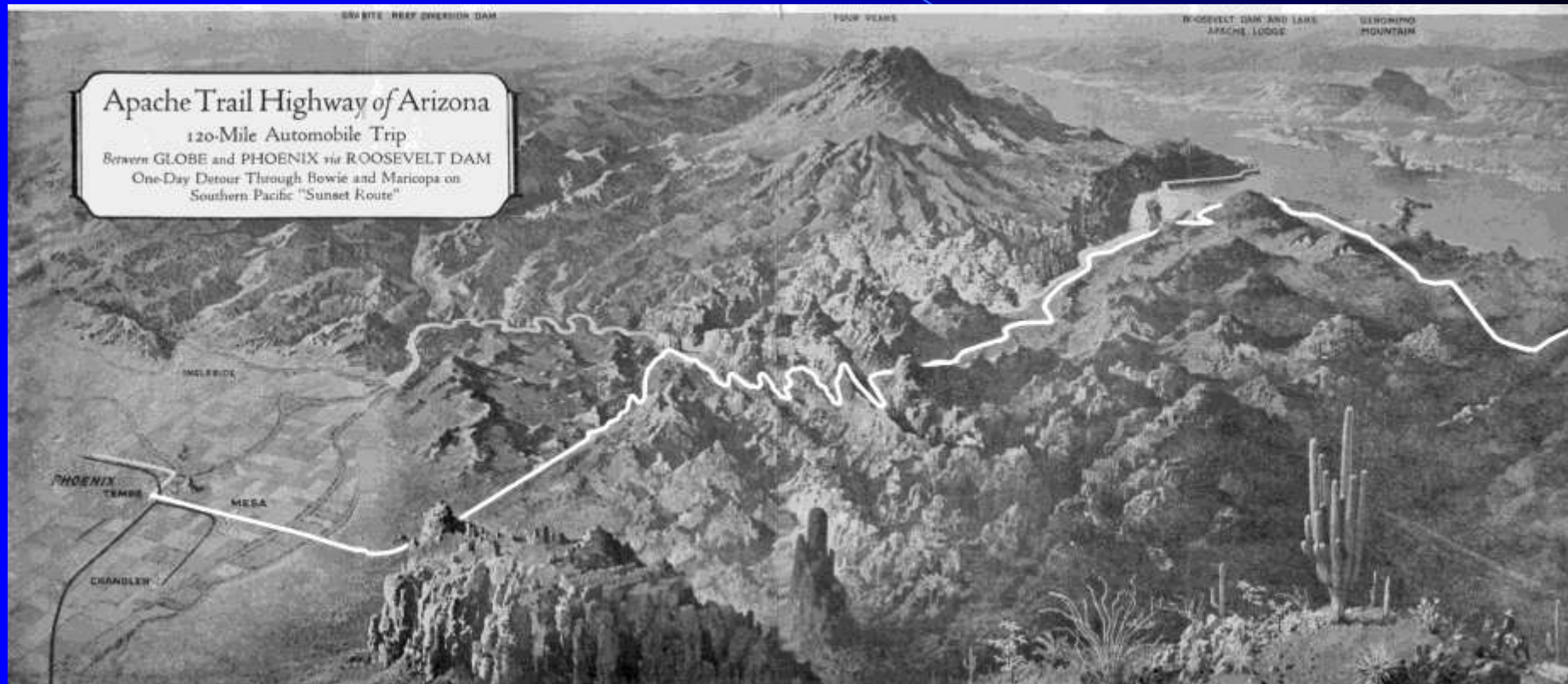
Original Arizona State Highway System (Not numbered)

- 1 - Phoenix to Yuma Highway
- 2 - Phoenix – Prescott – Camp Verde – Flagstaff – Grand Canyon Highway
- 3 - Nogales – Tucson – Florence – Chandler – Mesa – Phoenix Highway
- 4 - Tucson – Empire – Tombstone – Bisbee – Douglas Highway
- 5 - Phoenix – Roosevelt – Globe – San Carlos - Safford – Clifton – Duncan Highway

The Northern Highway (added in 1913)
Old route 66 alignment.



Apache Trail

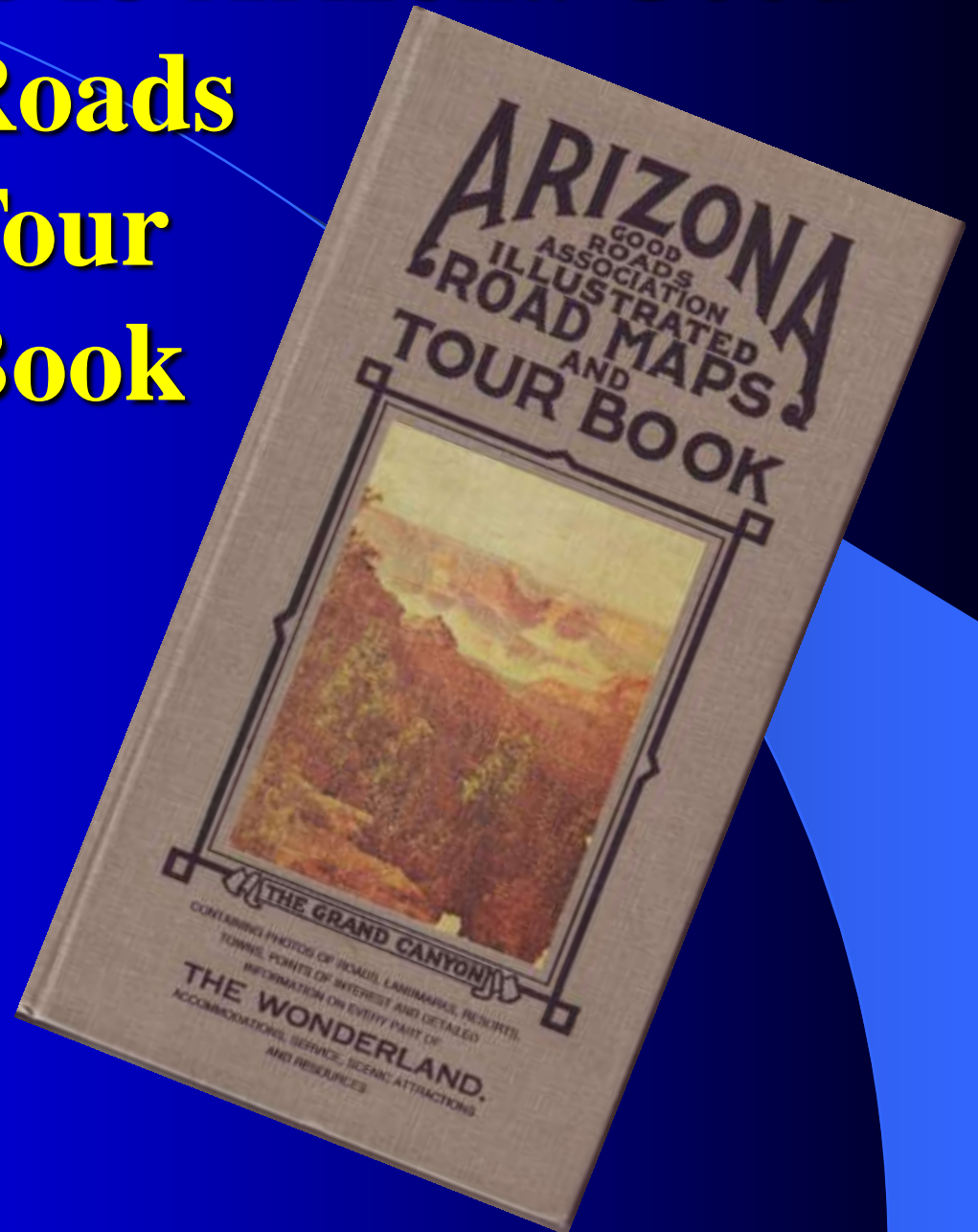


SR 88

PHOENIX TO GLOBE AND MIAMI
 VIA TEMPE & MESA 115.8 MILES
 FINE ROADS AND WONDERFUL SCENERY



1913 Arizona Good Roads Tour Book



Last Car to Pass over Apache Trail (Old mp 52-59)

Road flooded by waters of Apache Lake June 23, 1927



APACHE LAKE RISING

APACHE TRAIL, AZ

Political Fall-out Resulted.....

This Event Caused the Arizona State Legislature to abolish the old Board of Directors of State Institutions. August 11, 1927 created:



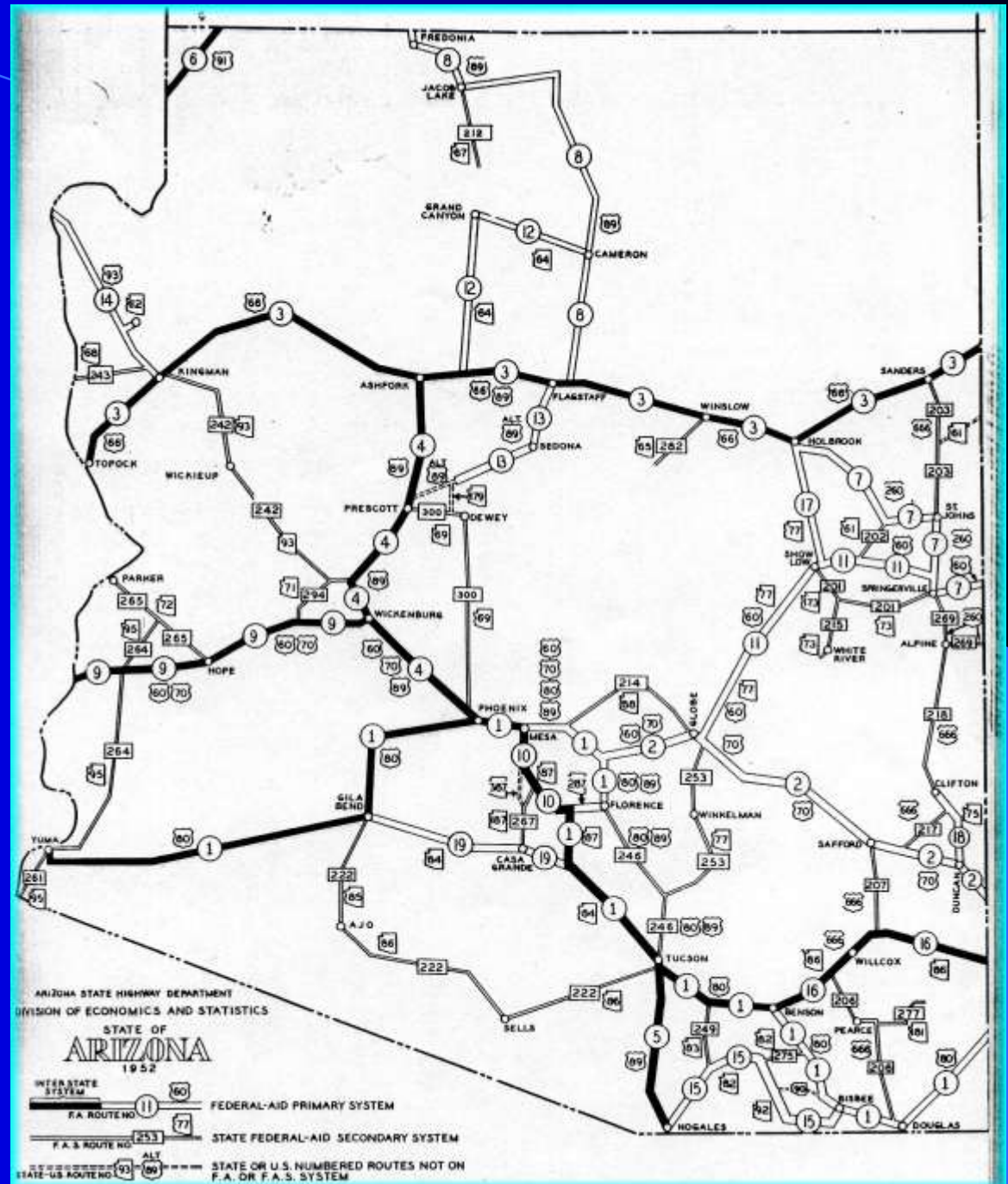
- **Arizona State Highway Commission**
 - **5 Member Board**
 - **6 Year terms**
 - **Represent counties**
- **Arizona State Highway Department**
 - **State Highway Engineer**
 - **Adopted original highway system**

ROAD Oversight

MODERN ERA

The background is a solid blue color. A thin, light blue curved line starts from the top left and arcs across the top of the page. On the right side, there is a larger, darker blue shape that resembles a quarter-circle or a wedge, pointing towards the center of the page.

1952 Arizona State Highway Map



Road Oil

to

Asphalt Paving



Significant Changes to the State Highway System Since 1950

Paving U.S. 93 from Congress to Kingman

Adding and Paving SR 87 from Mesa to Payson

Adding Current State Highways on Navajo Reservation

Paving All of SR 69 from Phoenix to Prescott

Adding and Paving SR 260 from Payson to Showlow

Constructing SR 95 from Parker to Topock

Adding SR 90 from Benson to Sierra Vista

Constructing the Entire Interstate System

Constructing Freeways in Phoenix Metropolitan Area

Arizona Highway Department -
Arizona Department of
Transportation







Dramatic Growth of the
State Highway System
from 1950 to 2006



1960's

Interstate Construction Boom 1958 - 1990



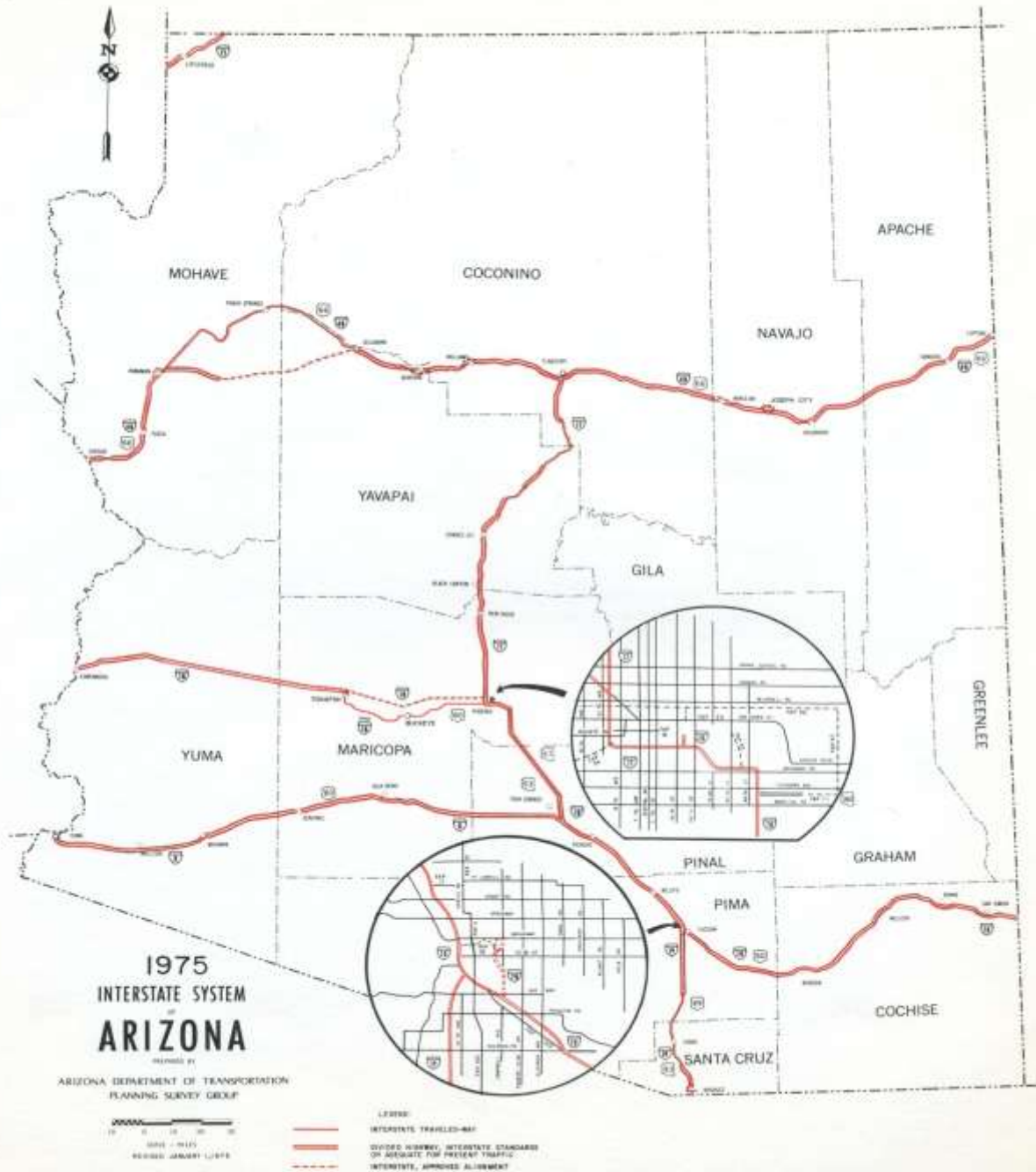
Route	Route Name	Total Miles	Frontage Miles	Year Complete
	Yuma – Casa Grande Highway	178.33	112.06	1979
	Various Segment Names	392.33	320.30	1990
	Nevada - Utah	29.39	6.80	1974
	Black Canyon Freeway	145.76	119.18	1973
	Nogales- Tucson Freeway	63.35	83.04	1981
	Topock-Flagstaff- Holbrook-Lupton	359.48	206.42	1985

Total FHWA Mileage = 1,168.64

1966 MAP

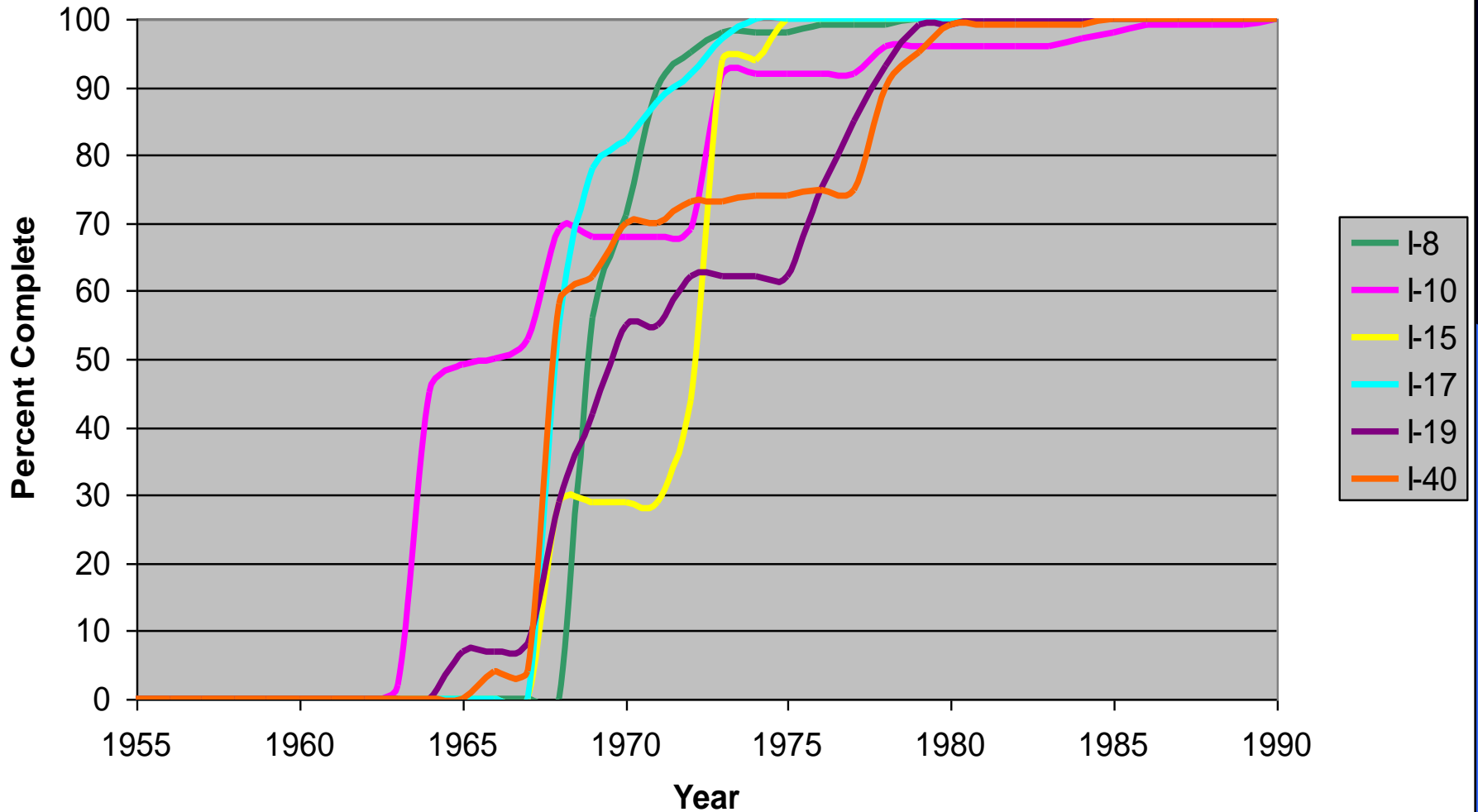


1975 MAP



The Majority of Interstate Construction Occurred Between 1963-1979

Interstate Completion Percentages



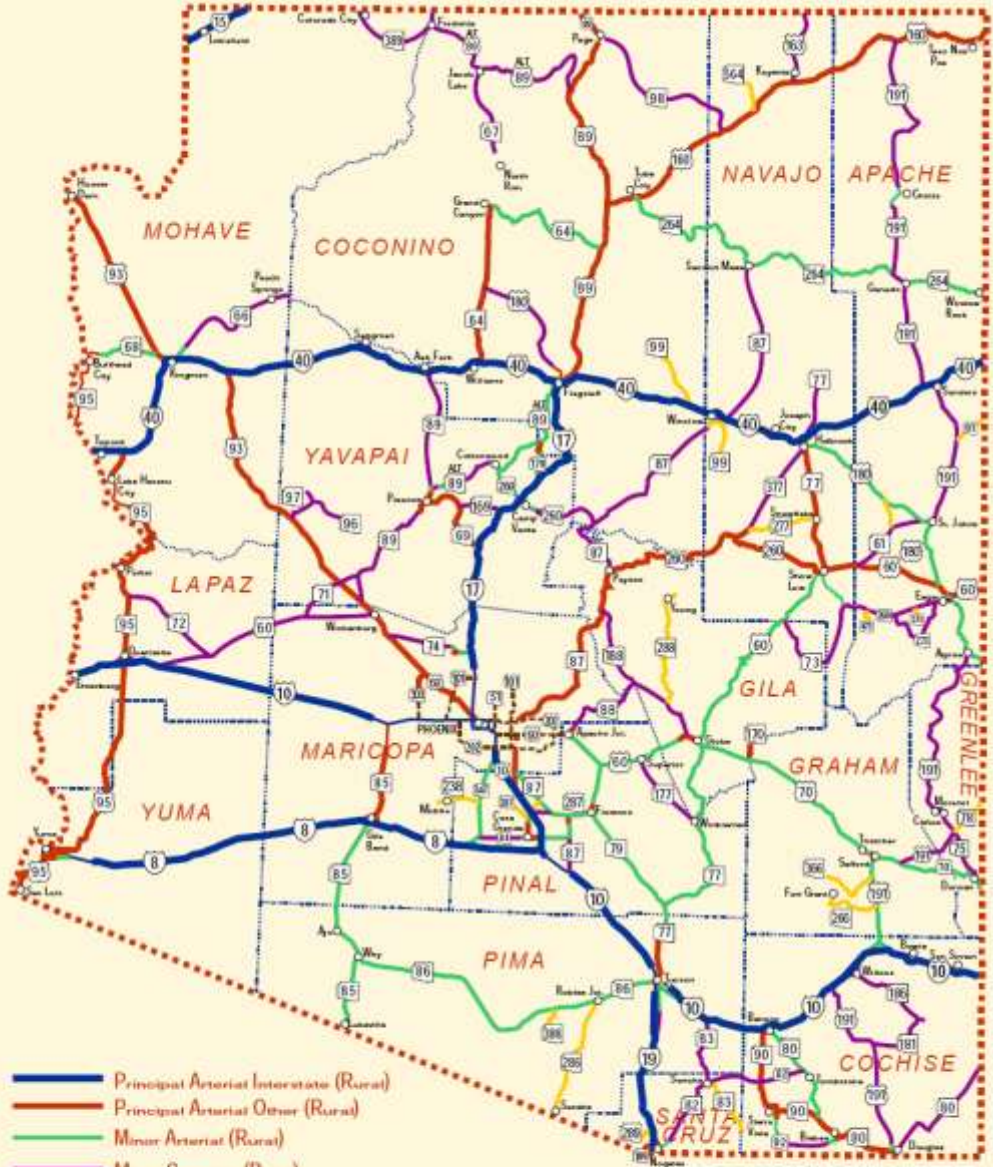
State Highway Mileage Growth

1951 - 3945 Miles

2000 - 6620 Miles

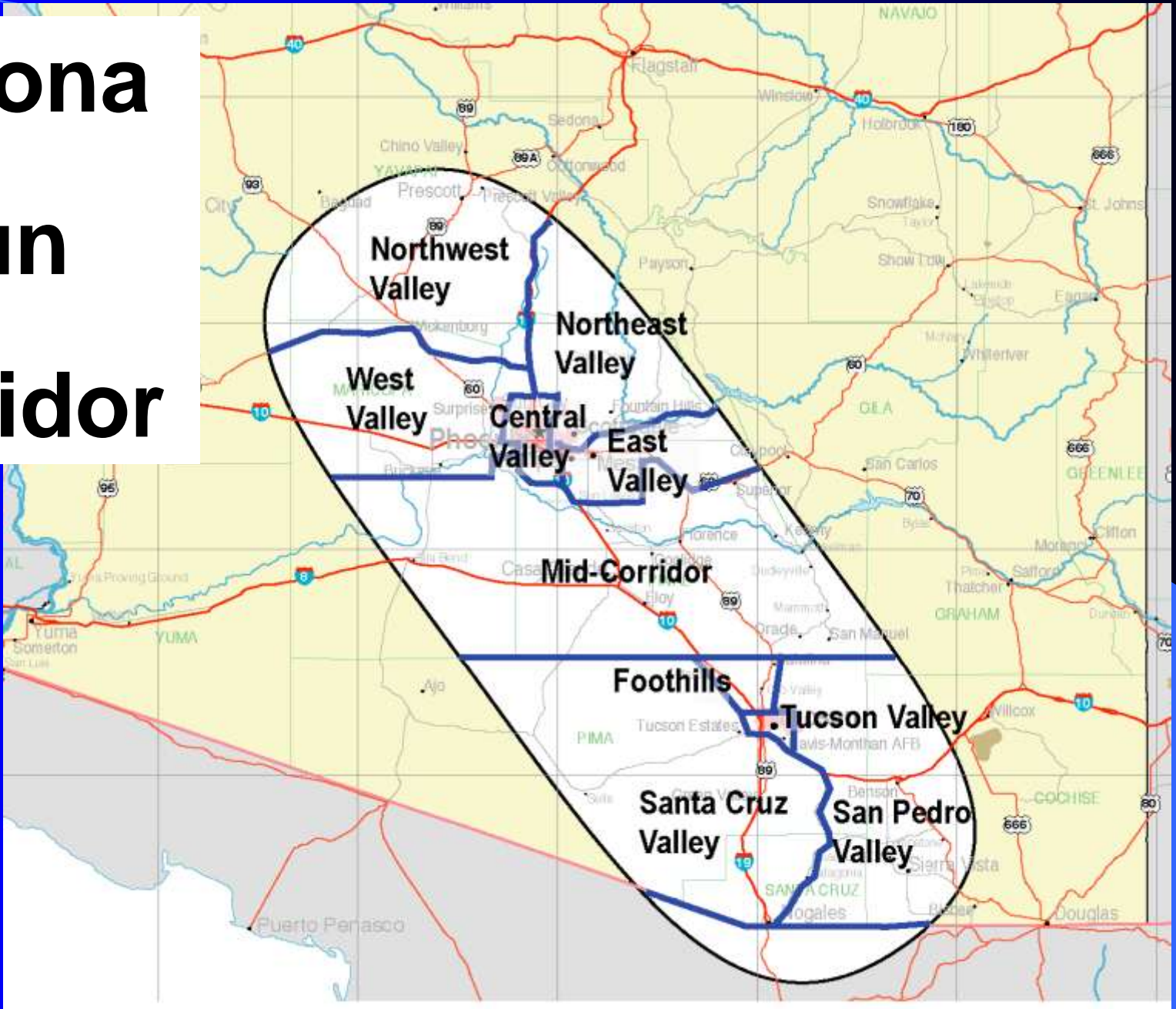
2005 - 6800 Miles

2004 State Highway Map



- Principal Arterial Interstate (Rural)
- Principal Arterial Other (Rural)
- Minor Arterial (Rural)
- Major Collector (Rural)
- Minor Collector (Rural)
- Principal Arterial Interstate (Urban)
- Principal Arterial Expressway (Urban)
- Principal Arterial Other (Urban)
- Minor Arterial (Urban)

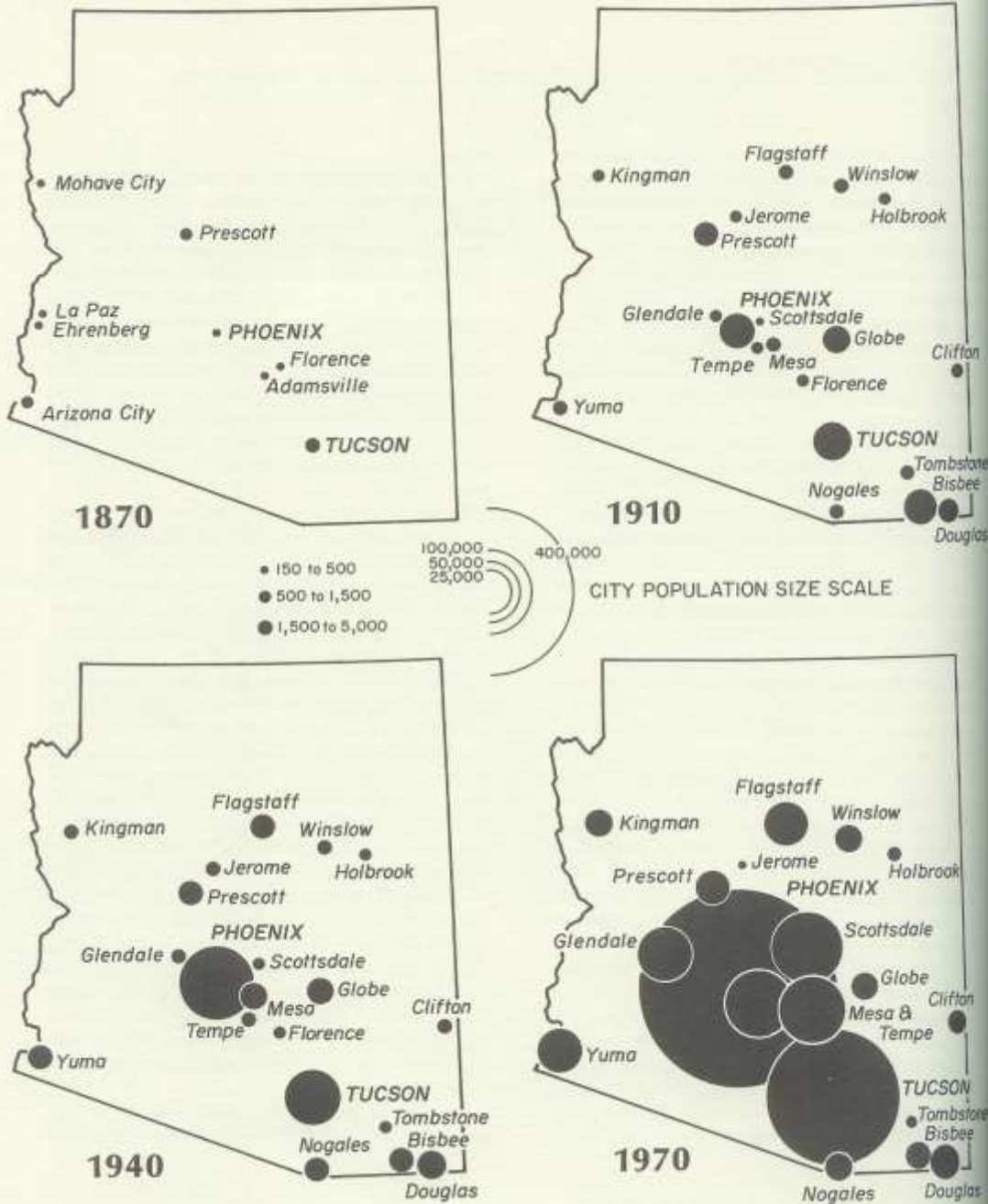
Arizona Sun Corridor



Population

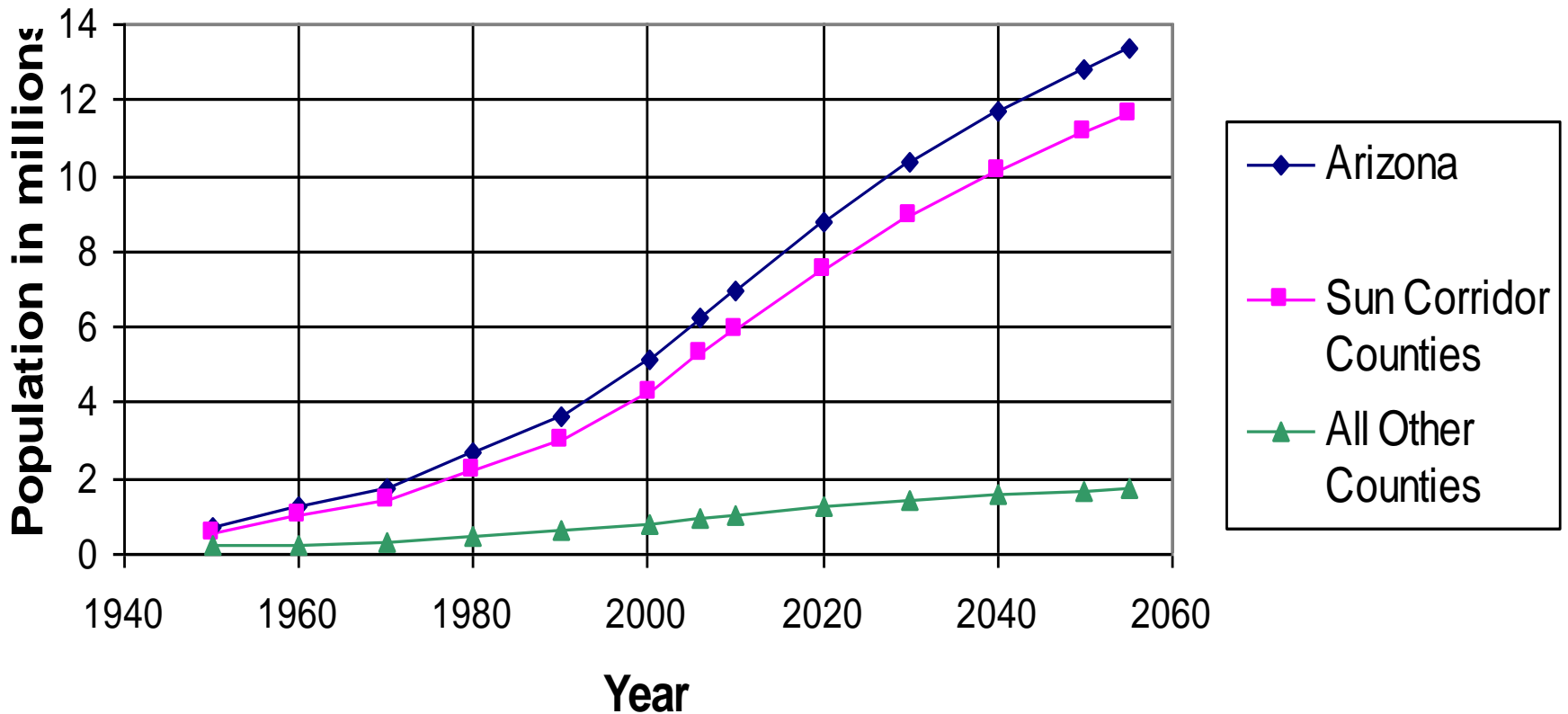
Early Population Growth

1870 - 1970



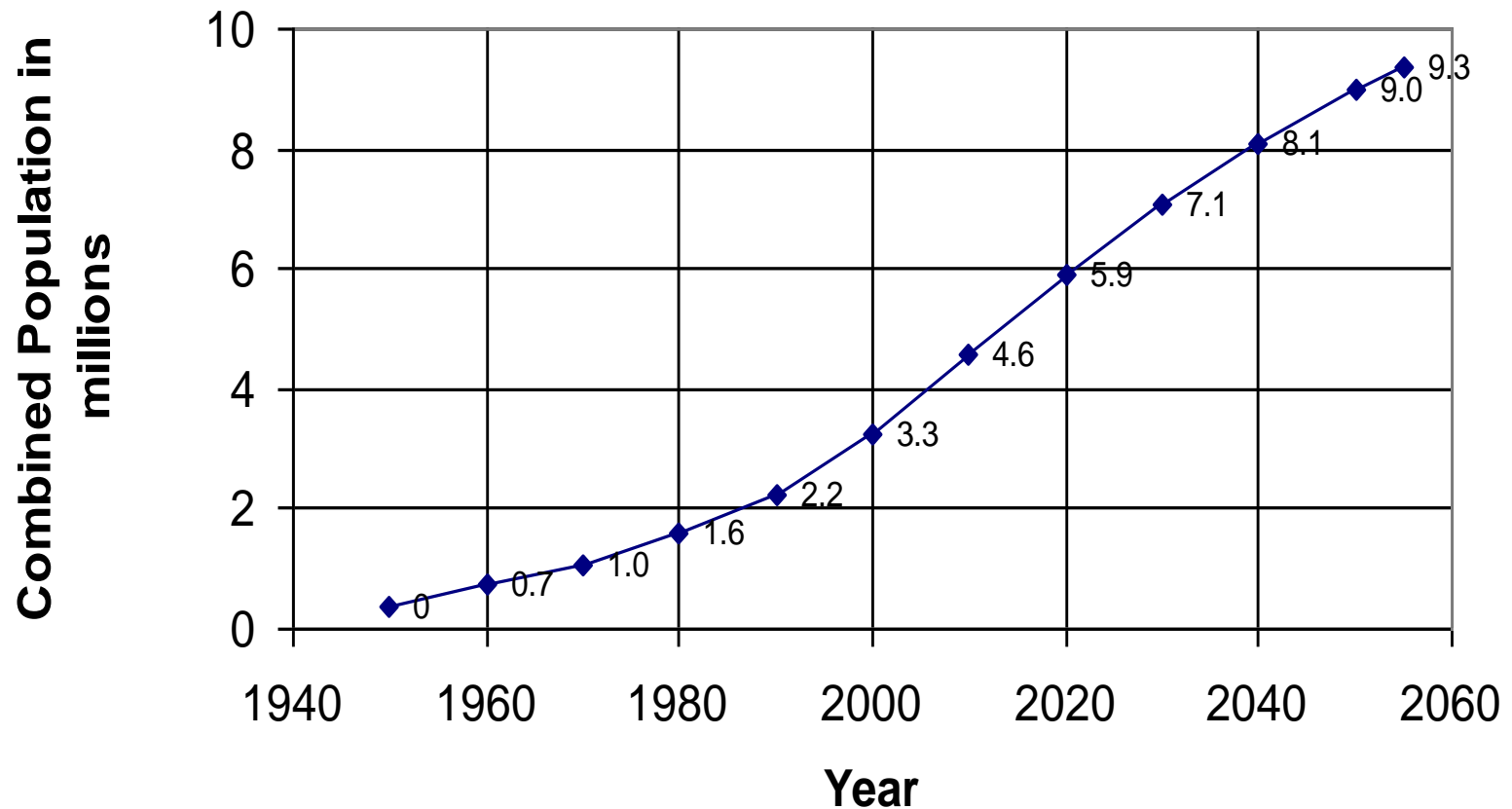
POPULATION GROWTH IN ARIZONA CITIES

Comparison of the Historical and Projected Arizona Population Growth with Sun Corridor and All Other Counties

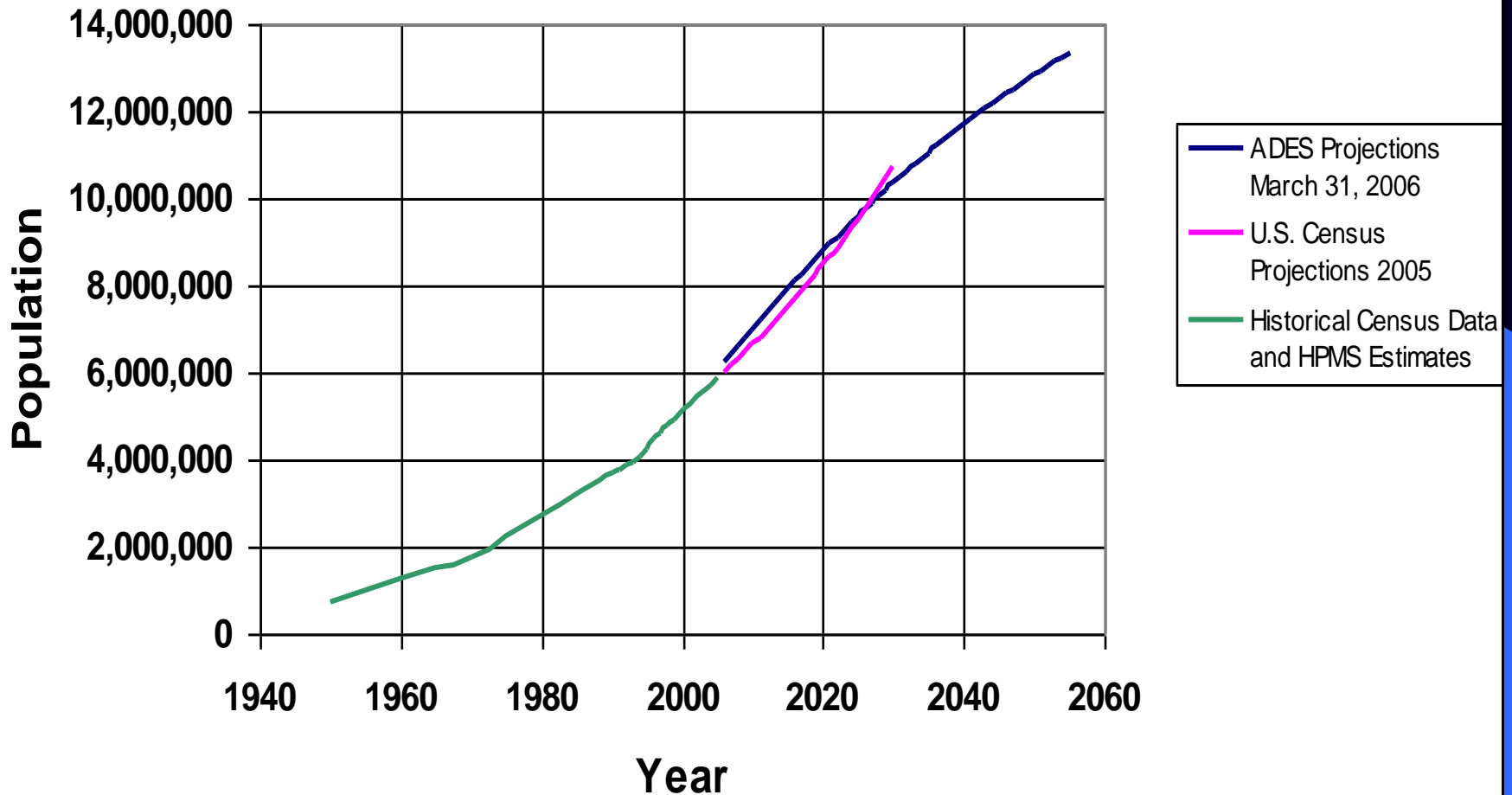


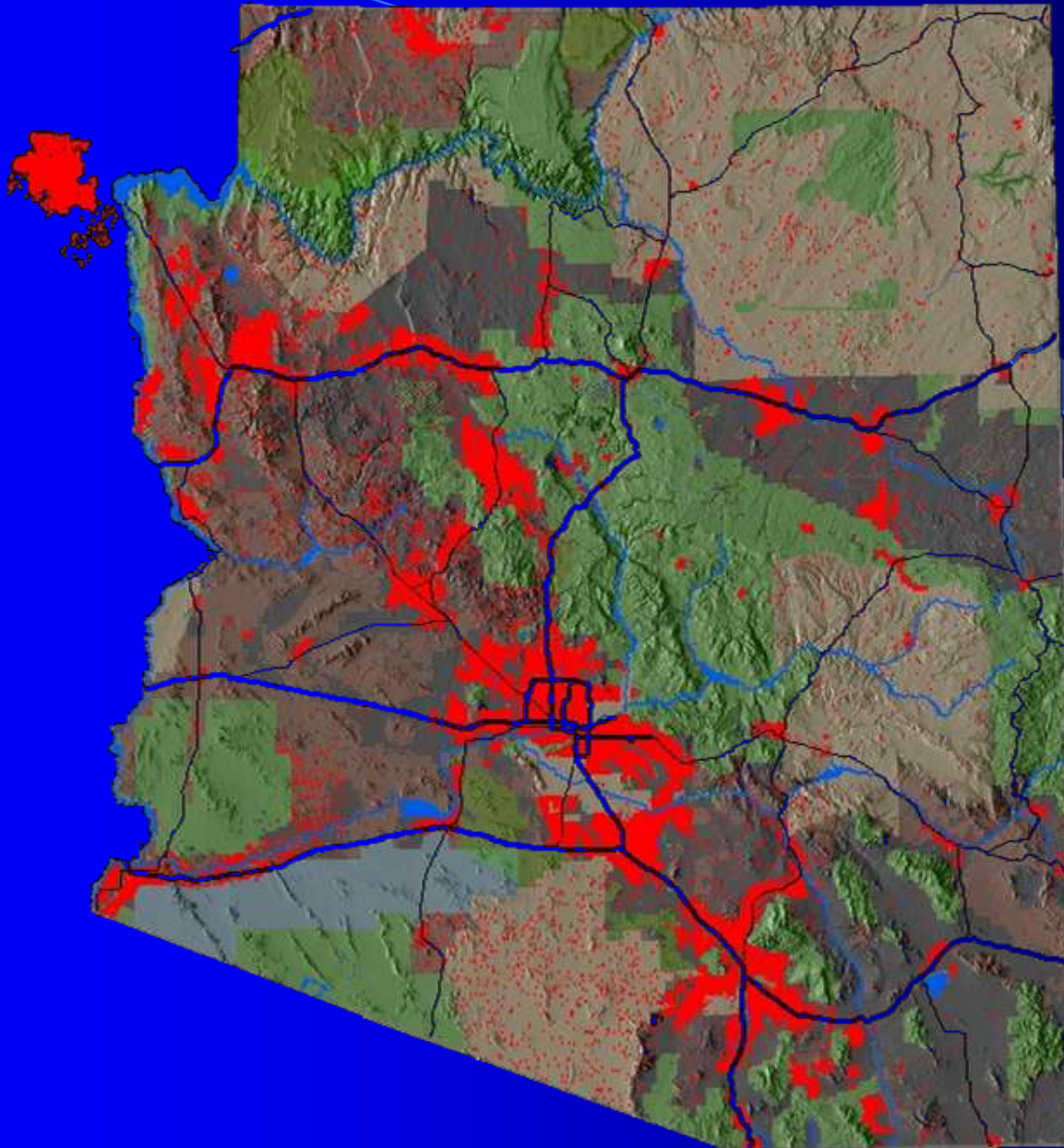
Population Projections for Maricopa and Pinal Counties (DES)

Historical and Projected(ADES) Population for Maricopa and Pinal Counties



Arizona Historical and Projected Population





2050
16.0 Million

Source:
Maricopa Association of Governments

Arizona Growth and Development Facts

- 13.3 million Population by 2055
 - U of A projects 14.6 million by 2036
- 220,000 Average Yearly Population Increase through 2005
 - Equivalent to another Phoenix every 7 years
- 88,000 New Housing Units/Year Average
 - 15,000 direct construction-related and 17,000 indirect jobs created for each 10,000 new housing units.

Arizona Growth and Development Facts (cont.)

- Up to 3% per Year Growth in non-Farm Jobs
- Up to 7% per Year Growth in Total Personal Income
- Up to 5% per Year Growth in Retail Sales

Potential Constraints on Growth and Development

- Land Ownership – Only 18% Private
 - Checkerboard ownership in some areas
- Natural Boundaries
 - Geography of the state
- Water
 - Ground water diminishing
 - Can the 100-year supply guarantee be maintained?

Potential Constraints on Growth and Development (cont.)

- Transportation and Utilities Infrastructure
 - Can it keep up?
 - Decision-making
 - Funding
 - Time to put in place
- Environment
 - Will people want to live in Arizona?
 - Air quality
 - Congestion
 - Natural environment

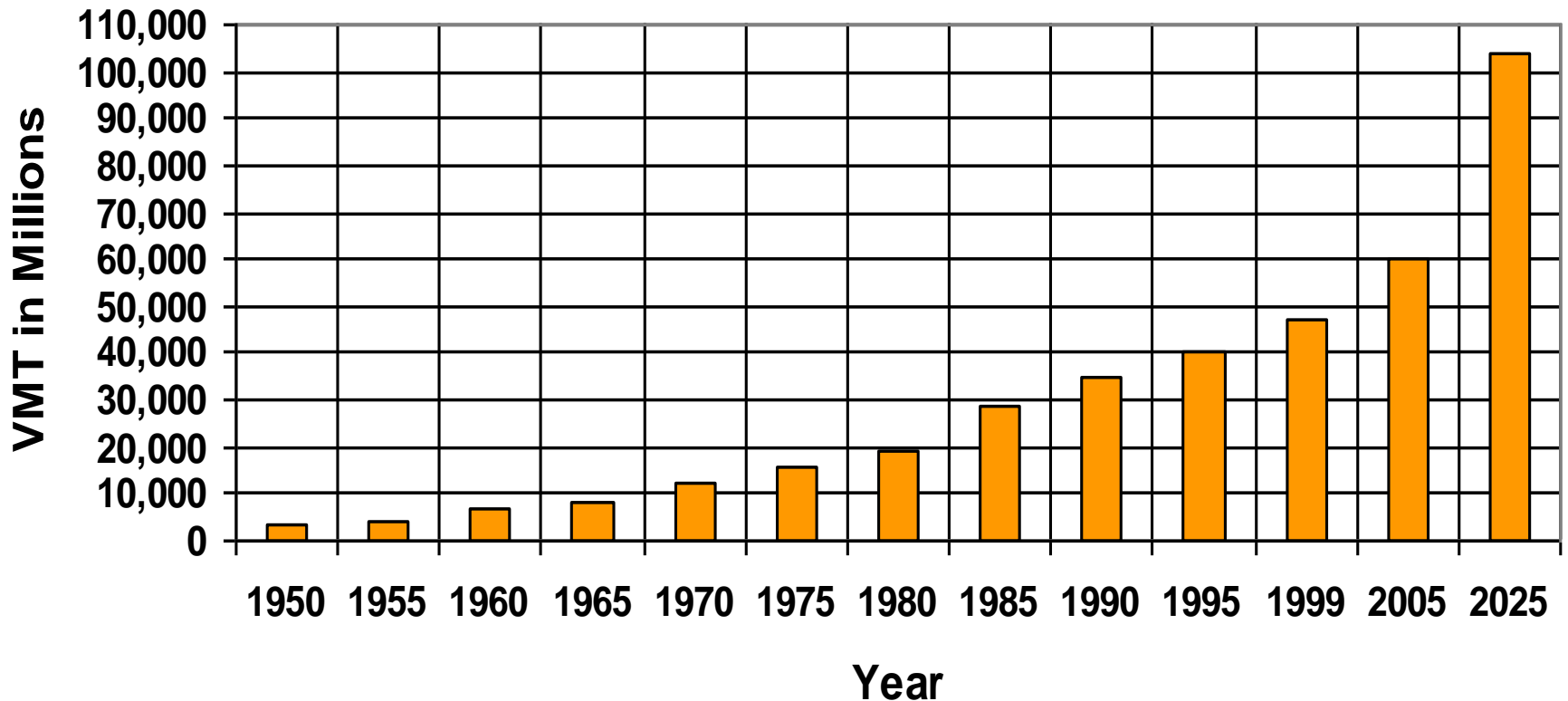
Potential Constraints on Growth and Development (cont.)

- Energy
 - Sources
 - Supply
 - Cost

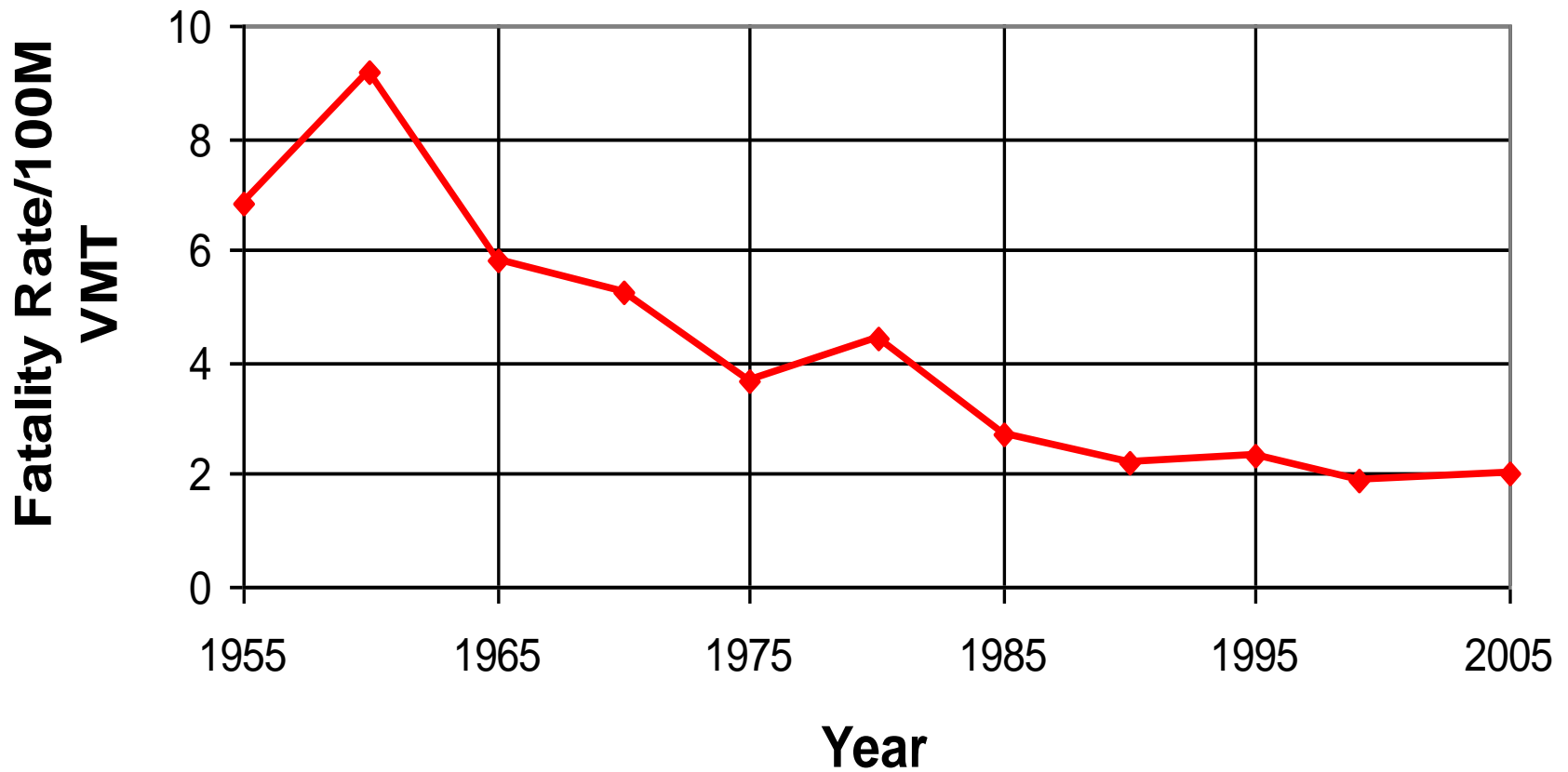
Today (Congestion)



Growth in Historical and Projected Total Annual VMT for Arizona

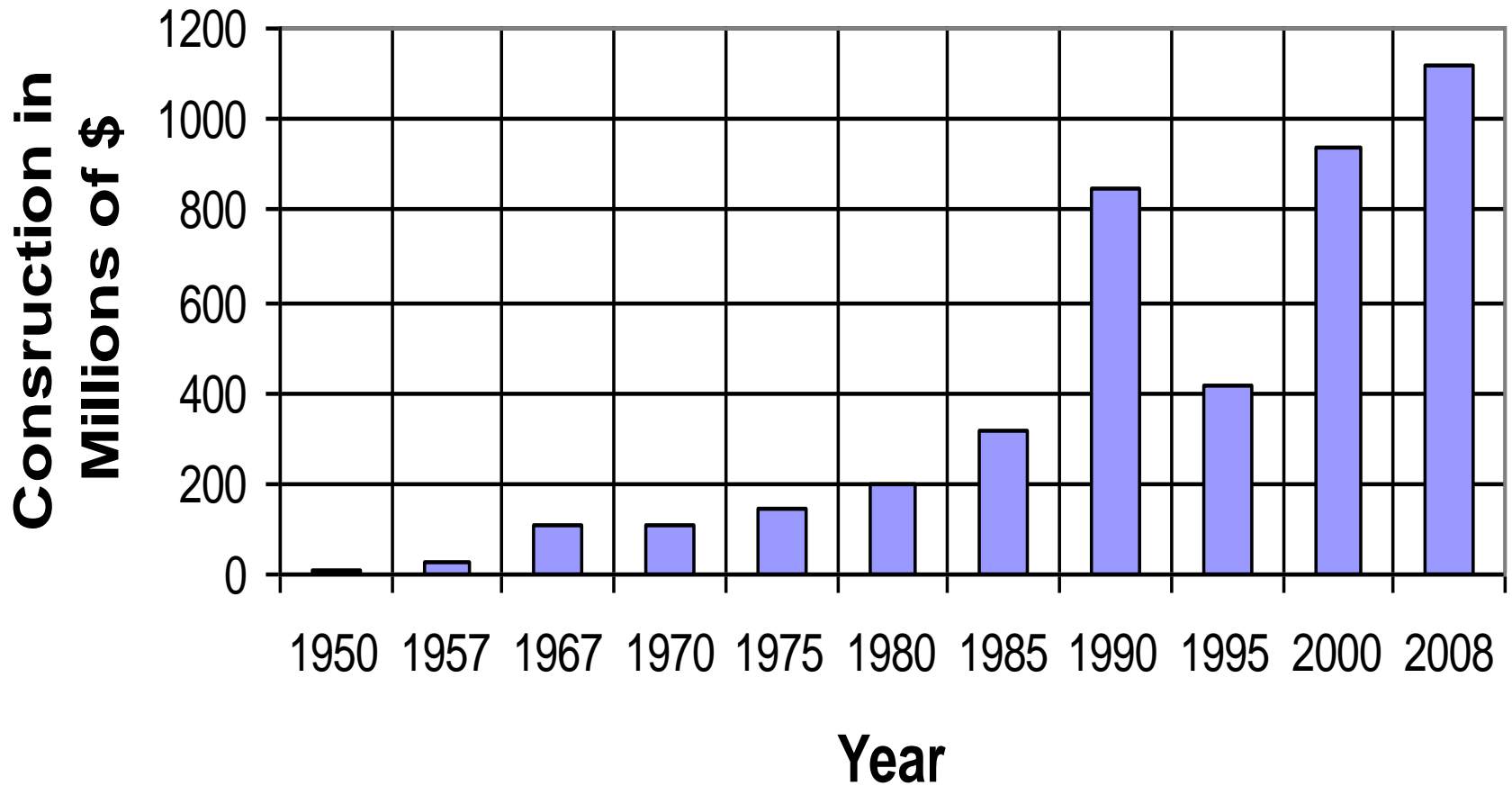


Fatal Accident Rate on Arizona Roads Since 1955



Revenue & Funding

State Highway Construction \$



History of State and Federal Gas Taxes

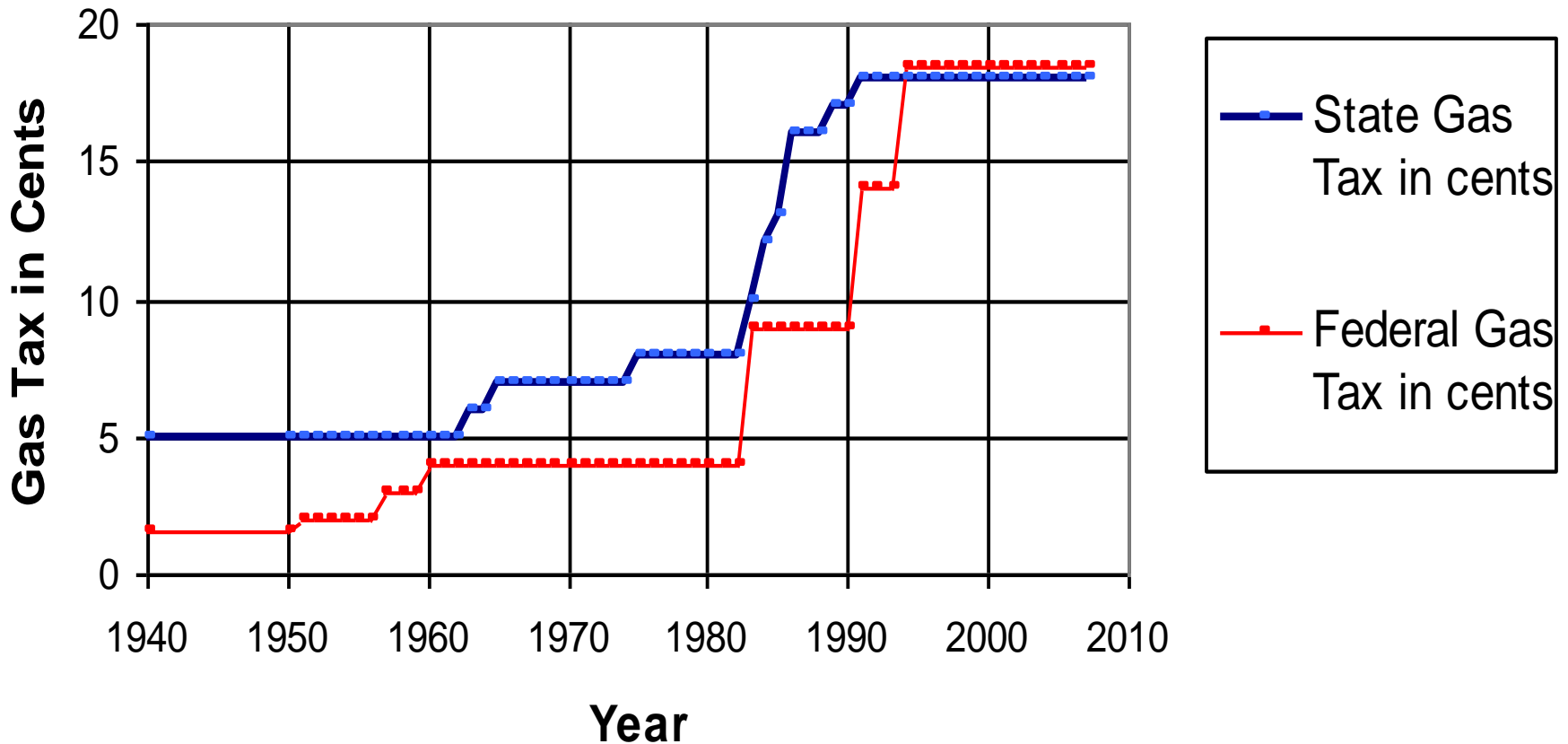
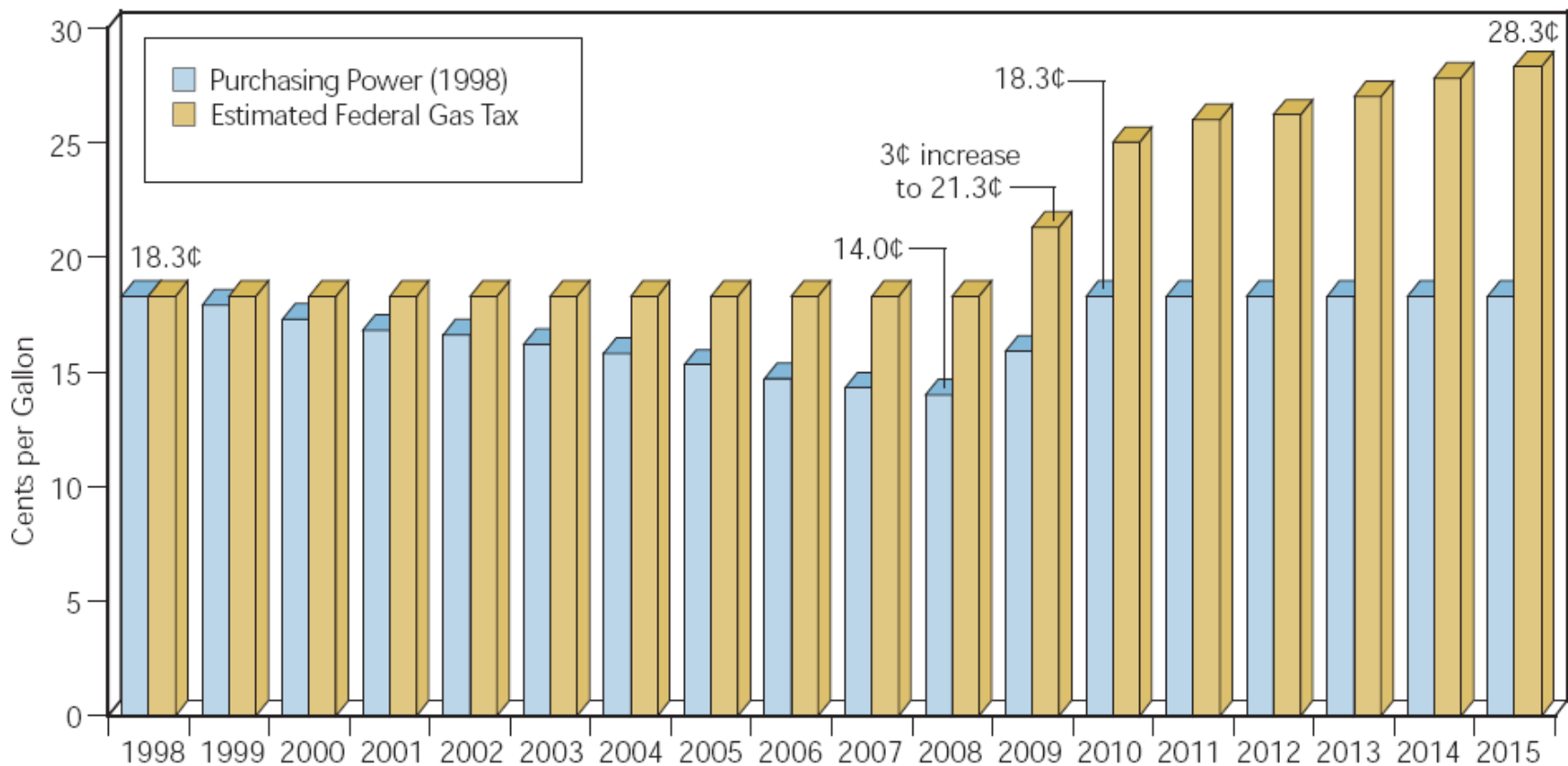


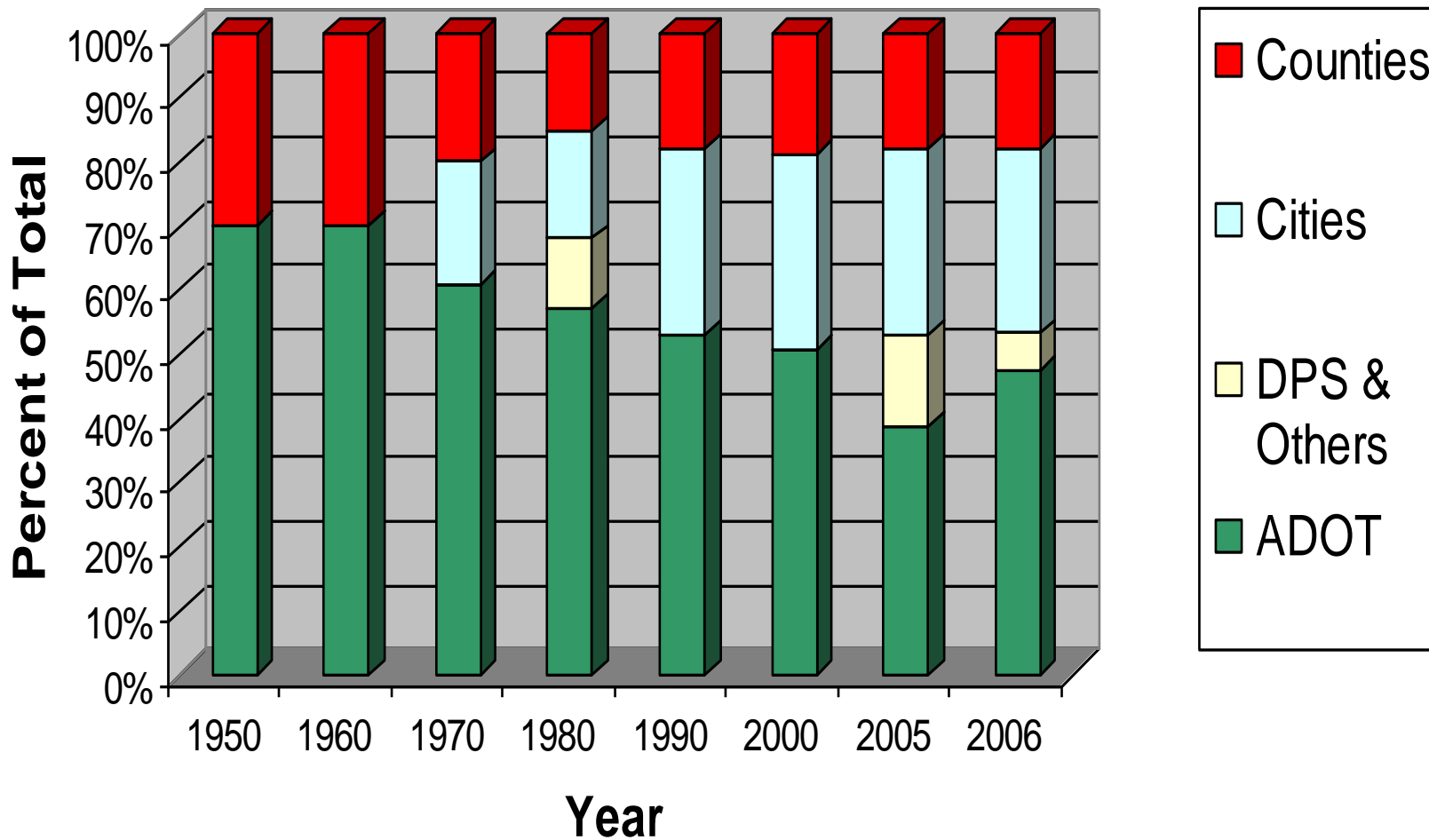
Figure 4. Federal Fuel Tax Rate Adjustments to Restore Purchasing Power



Note: The inflation effects are based on the Consumer Price Index actual rates from 1998 through 2006 and estimated from 2007 through 2015.

From AASHTO Future needs of U.S. Transportation System report....

Distribution of State HURF Funds

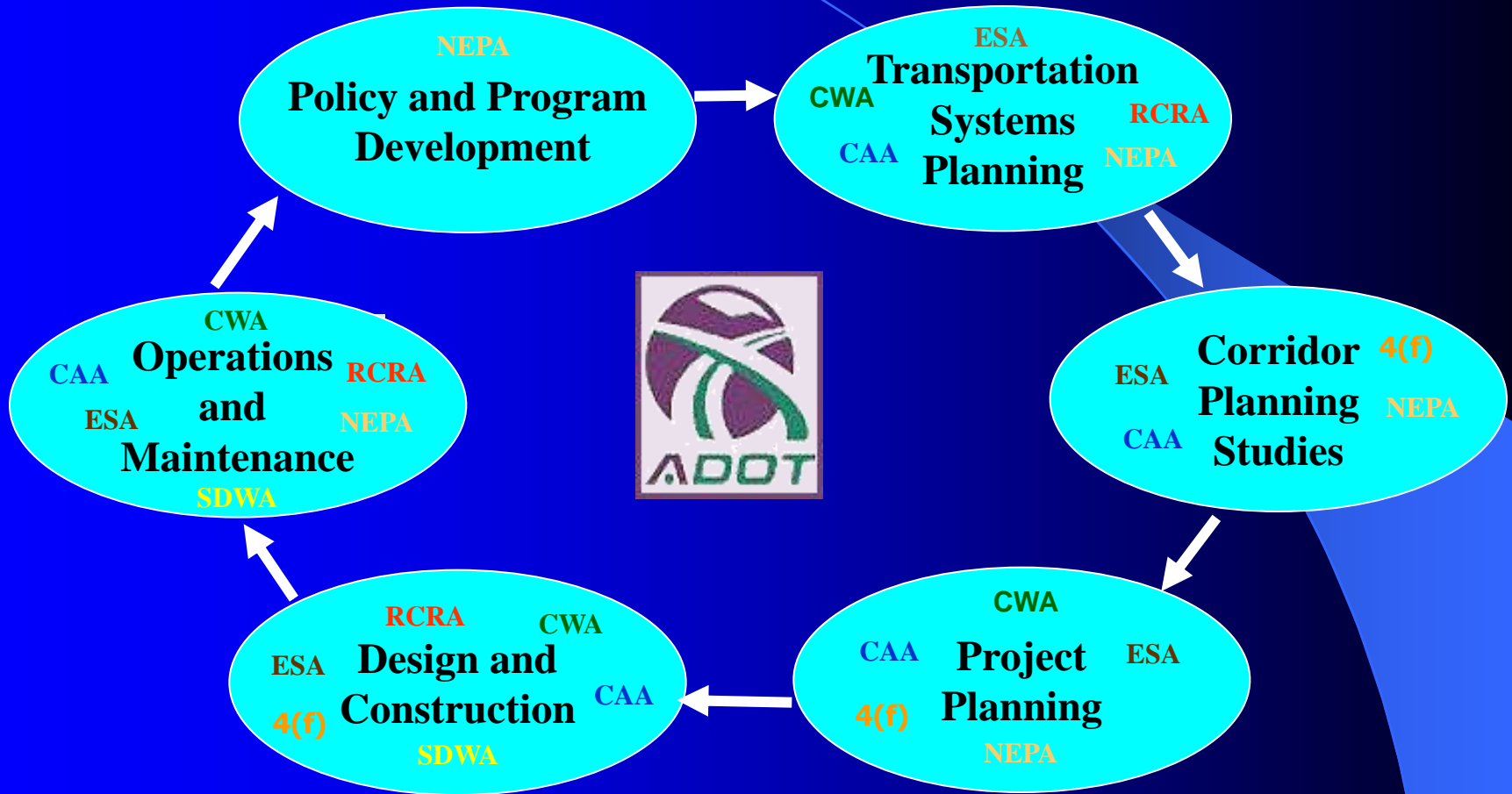


Environmentally Sensitive Highways





ADOT Transportation Responsibilities







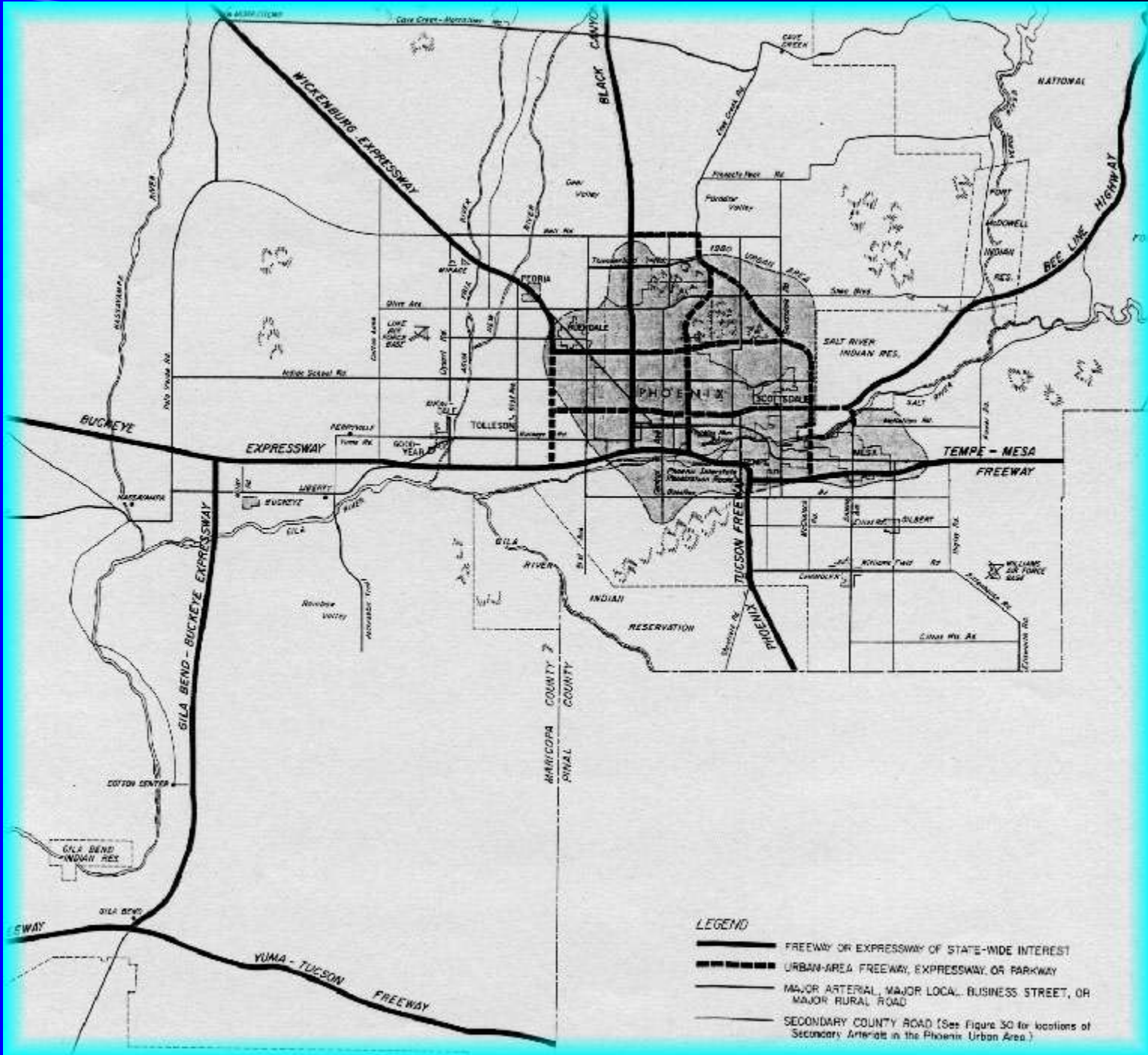
REST AREA STOP



Arizona Highway Department

Arizona Department of Transportation

Urban Freeway Systems
Growth



LEGEND

- FREEWAY OR EXPRESSWAY OF STATE-WIDE INTEREST
- URBAN-AREA FREEWAY, EXPRESSWAY, OR PARKWAY
- MAJOR ARTERIAL, MAJOR LOCAL, BUSINESS STREET, OR MAJOR RURAL ROAD
- SECONDARY COUNTY ROAD (See Figure 30 for locations of Secondary Arterials in the Phoenix Urban Area.)

THE PAPAGO FREEWAY
JOHANNESSEN & SIRAND



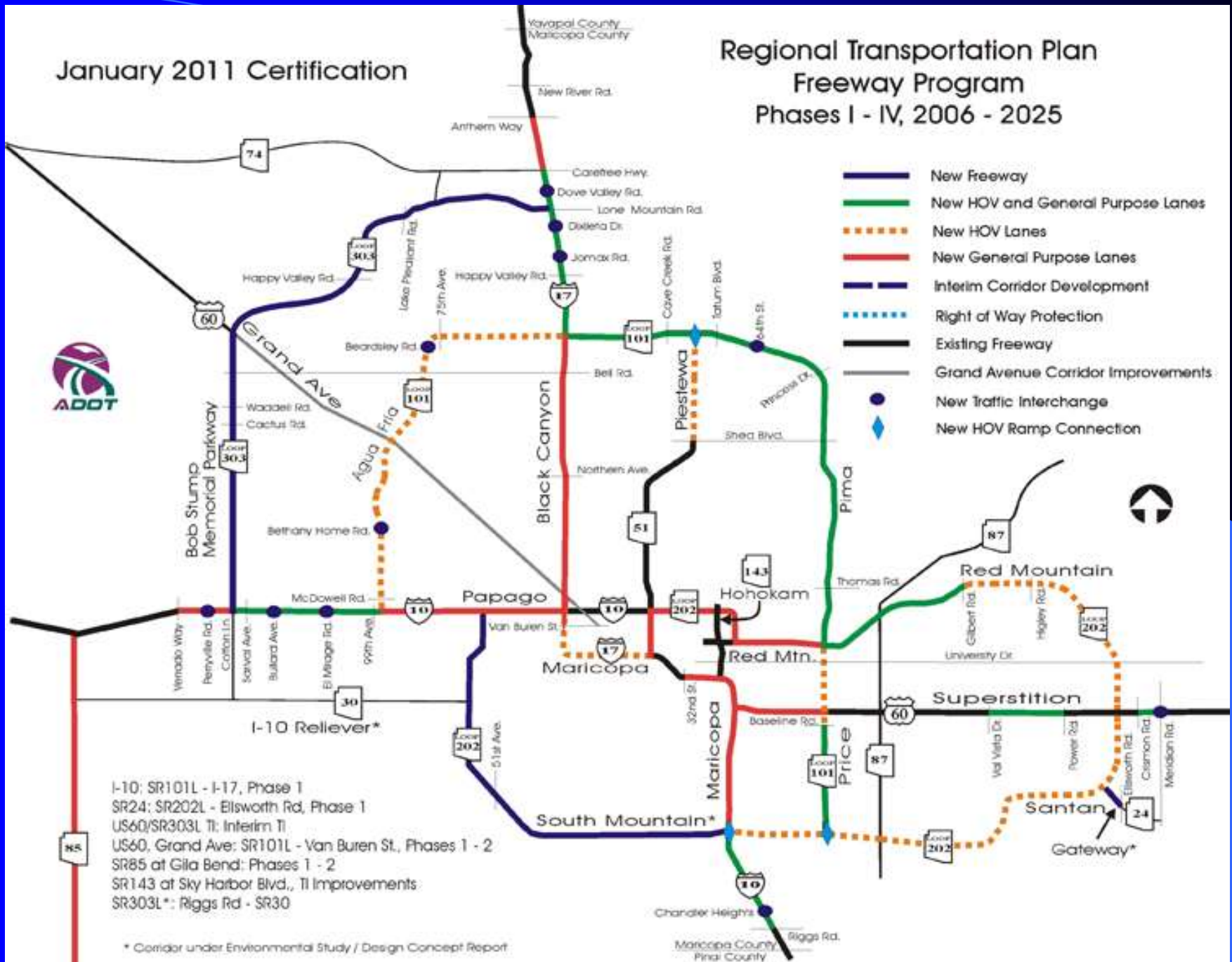


January 2011 Certification

Regional Transportation Plan Freeway Program Phases I - IV, 2006 - 2025



- New Freeway
- New HOV and General Purpose Lanes
- - - New HOV Lanes
- New General Purpose Lanes
- - - Interim Corridor Development
- · · · · Right of Way Protection
- Existing Freeway
- Grand Avenue Corridor Improvements
- New Traffic Interchange
- ◆ New HOV Ramp Connection



I-10: SR101L - I-17, Phase 1
 SR24: SR202L - Elsworth Rd, Phase 1
 US60/SR303L TI: Interim TI
 US60, Grand Ave: SR101L - Van Buren St., Phases 1 - 2
 SR85 at Gila Bend: Phases 1 - 2
 SR143 at Sky Harbor Blvd., TI Improvements
 SR303L*: Riggs Rd - SR30

* Corridor under Environmental Study / Design Concept Report

Central

Interstate 10 (Maricopa Freeway)
Interstate 17 (Black Canyon Freeway) South of Loop 101
State Route 51 (Piestewa Freeway)
State Route 143 (Hohokam Expressway)
State Route 153 (Sky Harbor Expressway)

East Valley

Loop 101 (Pima Freeway)
Loop 101 (Price Freeway)
Loop 202 (Red Mountain Freeway)
Loop 202 (Santan Freeway)
State Route 87 (Beeline Highway)
State Route 802 (Williams Gateway Freeway)
US 60 (Superstition Freeway)

Northwest

Interstate 17 (Black Canyon Freeway) North of Loop 101
Loop 101 (Agua Fria Freeway)
Loop 303 North of I-10
State Route 74 (Carefree Highway)
US 60 (Grand Avenue)

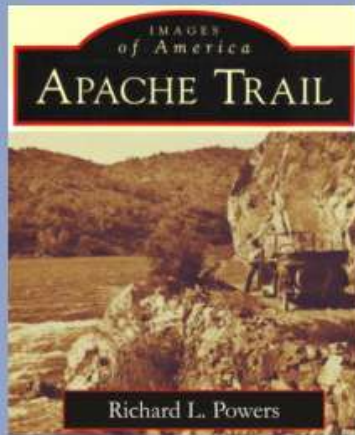
Southwest

Interstate 10 (Papago Freeway)
Loop 202 (South Mountain Freeway)
Loop 303 South of I-10
State Route 85
State Route 801



THANK YOU





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Upcoming Events

Valley of the Sun Romance Writers

Mr. Powers will be giving a presentation to the Valley of the Sun Romance Writers membership on Tuesday, September 13, 2011.

APWA History Presentation

Presentation will be made at the monthly AZ APWA Luncheon meeting on September 14th, at 12:00 noon. The luncheon will be held at the Phoenix Country Club.

ASU Materials Conference

Rick will be presenting the History of Arizona's Transportation system at the annual ASU Materials Conference on Tuesday November 11th at 11:00am. The conference will be held in the Memorial Union on the Arizona State University campus in Tempe.

Globe Historical Society First Friday

Powers

Welcome to Richard L. Powers Sr. Online



Author & Historian

Author of Images of America "Apache Trail"

Arizona Historian

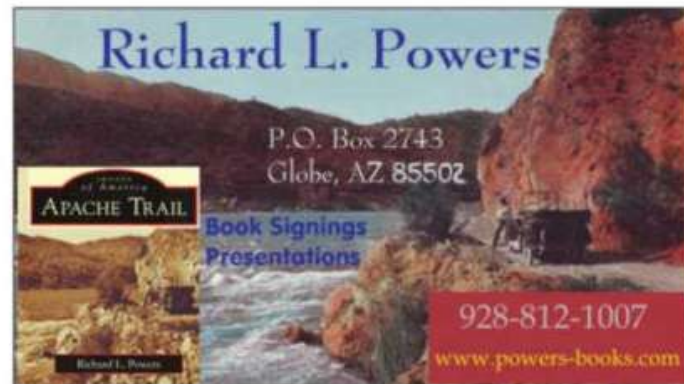
Richard L. Powers, P.E., is a longtime resident of Arizona and avid history buff with a keen interest in Arizona and local history. While working for the Arizona Department of Transportation (ADOT) he became interested in Arizona's transportation history and has given presentations on this topic in addition to Arizona's Interstate Highways System history and the history of the Apache Trail a unique road, the subject of this new book.

Rick's Bio



[AT About The Author.pdf](#)

Adobe Acrobat document [157.7 KB]



The Future of Transportation in Arizona



East Valley Tribune—Phoenix, AZ

• MAKE THIS YOUR LOCAL NEWS

Toll Roads?

Driving in Arizona could get pricey

By J. CRAIG ANDERSON TRIBUNE
East Valley Tribune
Feb. 3

Will the need for more freeways finally take its toll on Arizona motorists? Two Senate bills submitted this week would legalize the construction of toll roads or pay-as-you-go freeway lanes that could be built and operated by private companies. Backers of SB1576 and SB1635 point to the success of toll roads in other states such as Texas and a dearth of alternatives for the rapid expansion of Arizona's congested freeway system.

"We are 10 or 15 years behind the curve with building highways and freeways in the state," said SB1576 sponsor Sen. Jay Tibshraeny, R-Chandler. "I'm trying to get the private sector involved with building roads in the state that aren't being built publicly."

Arizona Daily Star
www.dailystar.com @www.azstarnet.com
Published: 01.15.2007

Toll roads may be in future for Arizona

Possible drying up of funding sources sparks discussion

By Andrea Kelly
ARIZONA DAILY STAR



EAST VALLEY Tribune.COM
Metro Phoenix's East Valley region

March 1, 2007

Pinal to launch toll road study
SARAH J. BOGGAN, TRIBUNE

The first-ever feasibility study looking at a toll road to link the fastest-growing areas of Pinal County to the East Valley has been commissioned.

The study comes after years of discussion about solutions to ease gridlock in Pinal County and adjacent East Valley communities.

Public – Private Partnerships

From the pages of Logistics Management

WASHINGTON—The United States needs to employ innovative public-private partnerships to combat increasingly crippling congestion on its aging transportation infrastructure system, Transportation Secretary **Mary E. Peters** told American business leaders at the U.S. Chamber of Commerce symposium on transportation and the global economy.

Traditionally, transportation has been funded by a combination of federal and state governments, *but government funds no longer are sufficient to meet demands of the future*. Forecasts of up to 70 percent growth in freight demand in the next 10 years are causing federal and state officials to rethink the way transport projects are funded, Peters said.....

HOV Lane Rentals?



Solo drivers step closer to carpool lanes

Mary Jo Pitzl

The Arizona Republic

Feb. 14, 2007 12:00 AM

Faced with growing traffic congestion on the state's freeways, a legislative panel Tuesday opted for a new approach: Pay for the fast lane.

Two ideas that would let single drivers pay to use the carpool lane cruised to unanimous approval from the Senate Transportation Committee. But the embrace of tolls only went so far: A proposal to build toll roads to serve the Valley's exploding suburbs failed.

Report of the

EIGHTY-EIGHTH ARIZONA TOWN HALL

**“ARIZONA’S RAPID GROWTH AND DEVELOPMENT:
NATURAL RESOURCES AND INFRASTRUCTURE”**

Prescott, Arizona

April 9 – 12, 2006

Arizona is in urgent need of accurate population estimates and projections for planning purposes.

Explosive growth and sprawl have resulted in an array of interconnected impacts...

Increased demand management and conservation can help Arizona meet its water needs for future growth, development and the economic vitality of communities.

Governor's Town Hall Growth in AZ

Arizona must integrate land use and transportation planning.

Increased demand management and conservation can help Arizona meet its water needs for future growth, development and the economic vitality of communities.

Vision 21

The image features the text "Vision 21" in a bold, three-dimensional, sans-serif font. The letters are a vibrant red color with a slight gradient and a dark shadow on their bottom and back faces, giving them a 3D appearance. The text is set against a solid blue background. A thin, white, curved line arcs across the upper portion of the image, starting from the left and curving towards the right. The overall composition is clean and modern.

Vision 21 – Recommendations for INCREASE DEDICATED TRANSPORTATION REVENUES

Increase Fuel Taxes

Establish a Dedicated Statewide Sales Tax

Establish dedicated statewide development fees for system expansion

Rededicate Flight Property Taxes to the State Aviation Fund

Establish State Toll Road Authority Encourage

Public-Private Partnerships

Expand Privatization Authority

Vision 21 – Recommendations (Continued)

Increase Minimum Federal Highway Trust Fund Distributions

Increase in Highway User Fund Bonding Capacity

Establish Automatic Enactment of State Gas Tax Increase to
Offset Federal Fuel Tax Reductions

Restore Local Transportation Taxing Authority

Authorize State Collection of Tribal Vehicle Taxes

**MOVE
AZ**
Long Range
Transportation
Plan

MOVING-AZ

Multi-Modal Transportation

Table ES.6 Demand/Utilization of Transportation Modes

Mode	Metric	Demand/Utilization	
		2002	2025
Road	Vehicle Miles of Travel (VMT)	150,000,000	276,000,000
Rail	Daily boardings	207	409
Transit			
Intercity Bus	Daily boardings	670	910
Urban Transit	Daily boardings	271,000	429,000
Rural Bus	Daily boardings	4,100	7,400
Aviation	Daily enplanements	47,600	104,100
Bicycle	Daily trips	310,300	501,100
Pedestrian	Daily trips	976,400	1,597,500

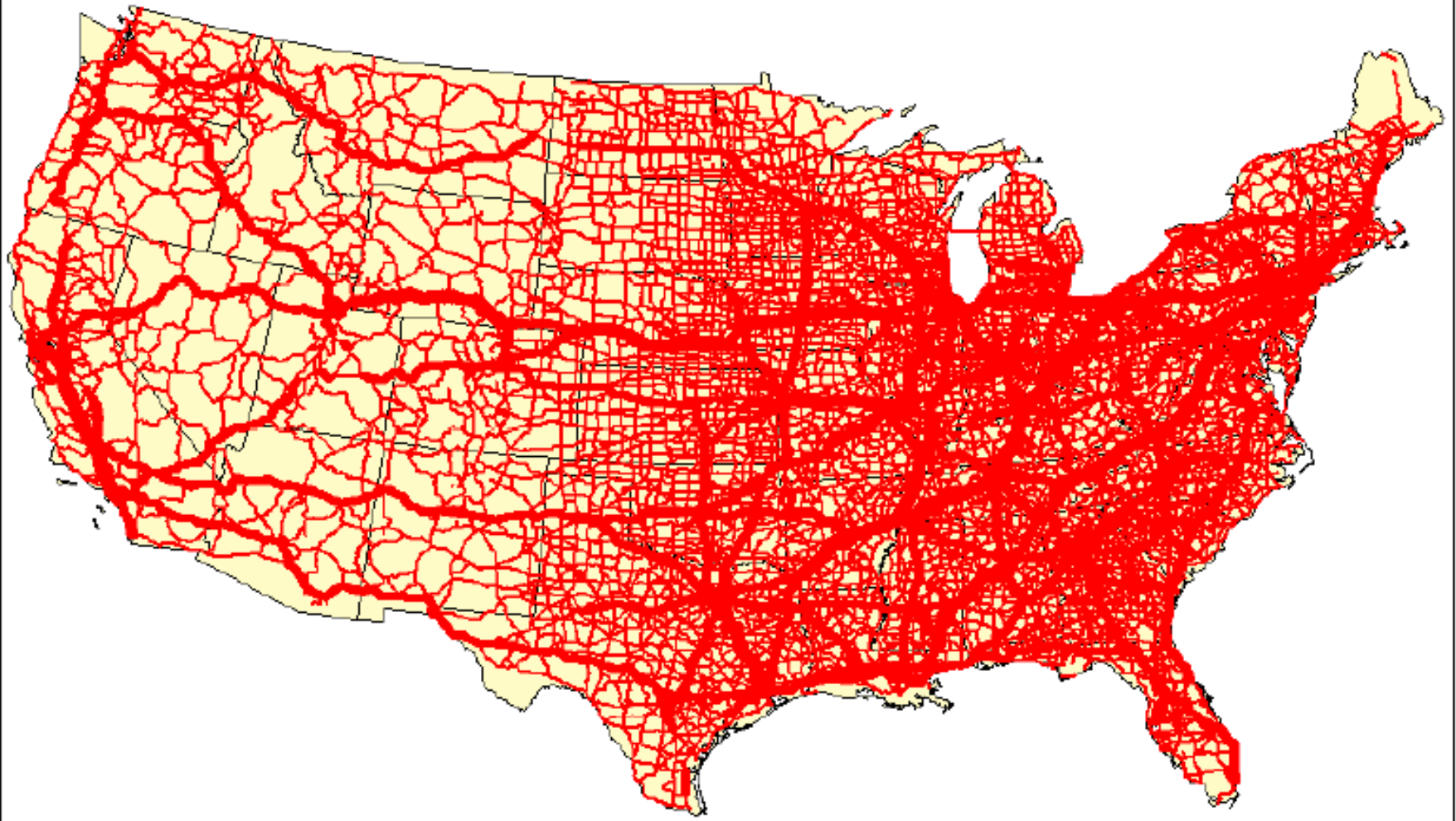
Freight Shipments by Mode

ARIZONA	Tons (millions)			Value (billions \$)		
	1998	2010	2020	1998	2010	2020
State Total	182	292	396	147	343	616
By Mode						
Air	<1	<1	2	27	75	139
Highway	151	249	341	110	249	445
Other ^a	<1	<1	<1	<1	<1	<1
Rail	30	43	53	10	20	32
Water	0	0	0	0	0	0
By Destination/Market						
Domestic	169	266	357	131	294	521
International	12	26	39	16	49	95

Note: Modal numbers may not add to totals due to rounding.

^a The "Other" category includes international shipments that moved via pipeline or by an unspecified mode.

Domestic Truck Freight Flows





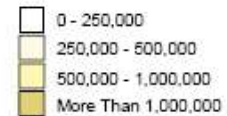
International Truck Flows
for Border Crossings
(1998)

ARIZONA

Network Flows
(Tons)

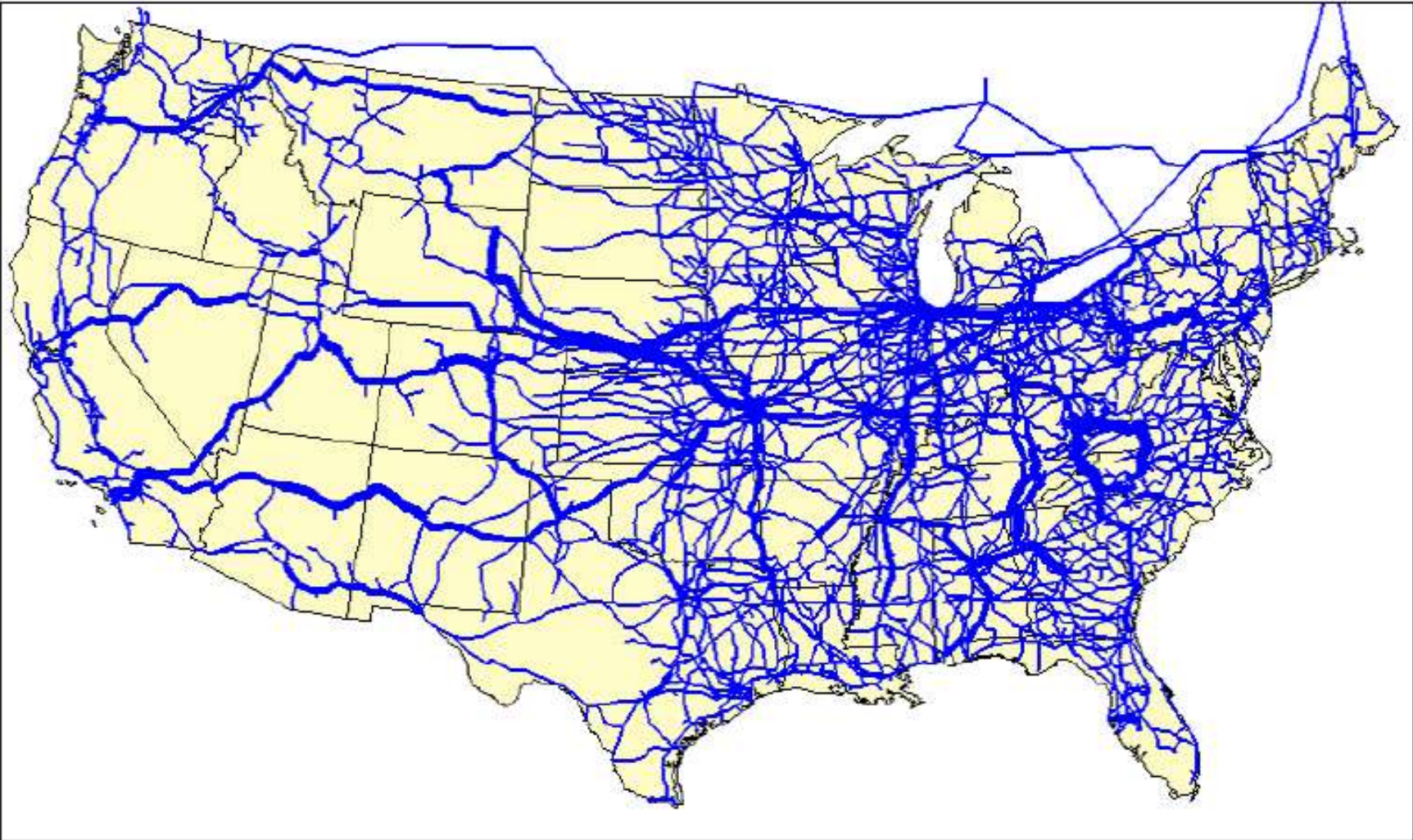


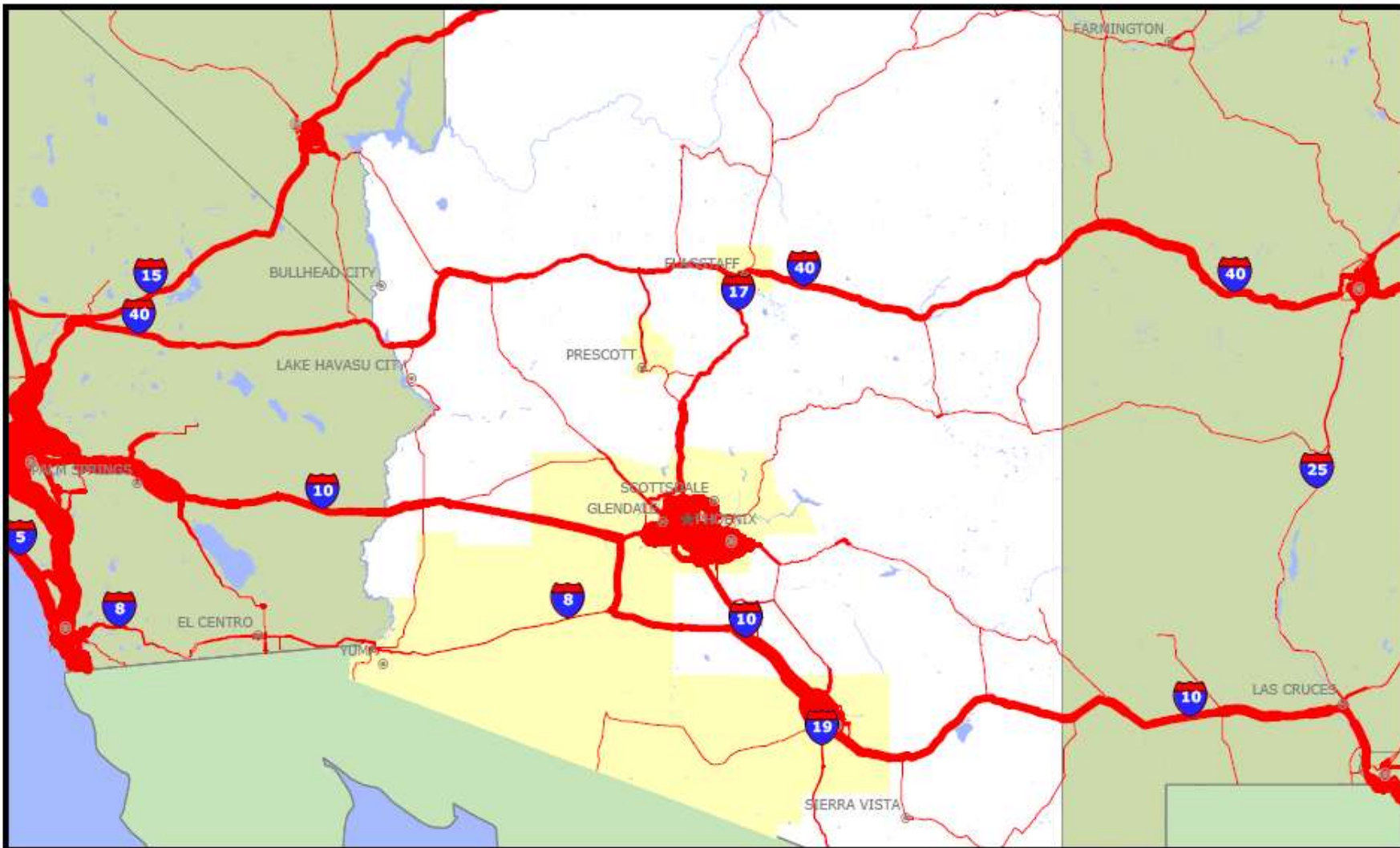
**Border Crossing
to State Flows**
(Tons)



U.S. Department of Transportation
Federal Highway Administration
Office of Freight Management and Operations
Freight Analysis Framework

Domestic Rail Freight Flows





US Department of Transportation
 Federal Highway Administration
 Office of Freight Management and Operations
 Freight Analysis Framework

Estimated Average Annual Daily Truck Traffic: 2020

ARIZONA

Truck Volume Scale



50,000 25,000 12,500

Building a Quality Arizona

Statewide Transportation Framework Studies

In *Building a Quality Arizona*, Councils of Governments (COGs) and Metropolitan Planning Organizations (MPOs) from around the state worked with the Arizona Department of Transportation, the Arizona State Legislature, the Governor's Office, and the business community to identify and document state infrastructure needs.

The state Long-Range Transportation Plan (LRTP) is ADOT's role in implementing Building a Quality Arizona (bqAZ) the Statewide Framework Transportation Planning Study. By grounding the LRTP goals and objectives in bqAZ, ADOT is defining its role in implementing the agreed upon vision and guiding principles. Once the LRTP is adopted it will be ADOT's commitment to the partnership required to implement bqAZ. It is important to remember that bqAZ included local roads and other types of facilities and the LRTP does not. It only includes the state transportation system.

Scott Omer

TRANSIT



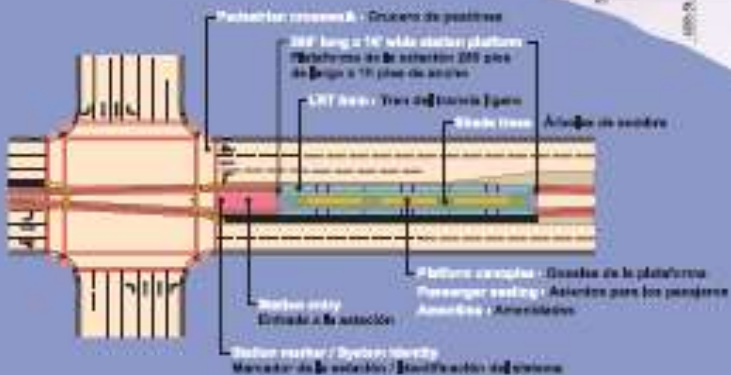


Light Rail.....

20-MILE METRO SYSTEM / SISTEMA DE METRO DE 20 MILLAS



- Can be linked into trains of up to three vehicles
- Holds four bikes and four wheelchairs per vehicle
- 66 seated passenger capacity with 200 capacity per vehicle
- 198 seated passenger capacity with 600 capacity per three-car train
- Puede engancharse en tramos de hasta tres vehículos
- Transporta cuatro bicicletas y cuatro sillas de ruedas por vehículo
- Capacidad para 66 pasajeros sentados y de 200 pasajeros por vehículo
- Capacidad para 198 pasajeros sentados y de 600 pasajeros por tren de tres vehículos

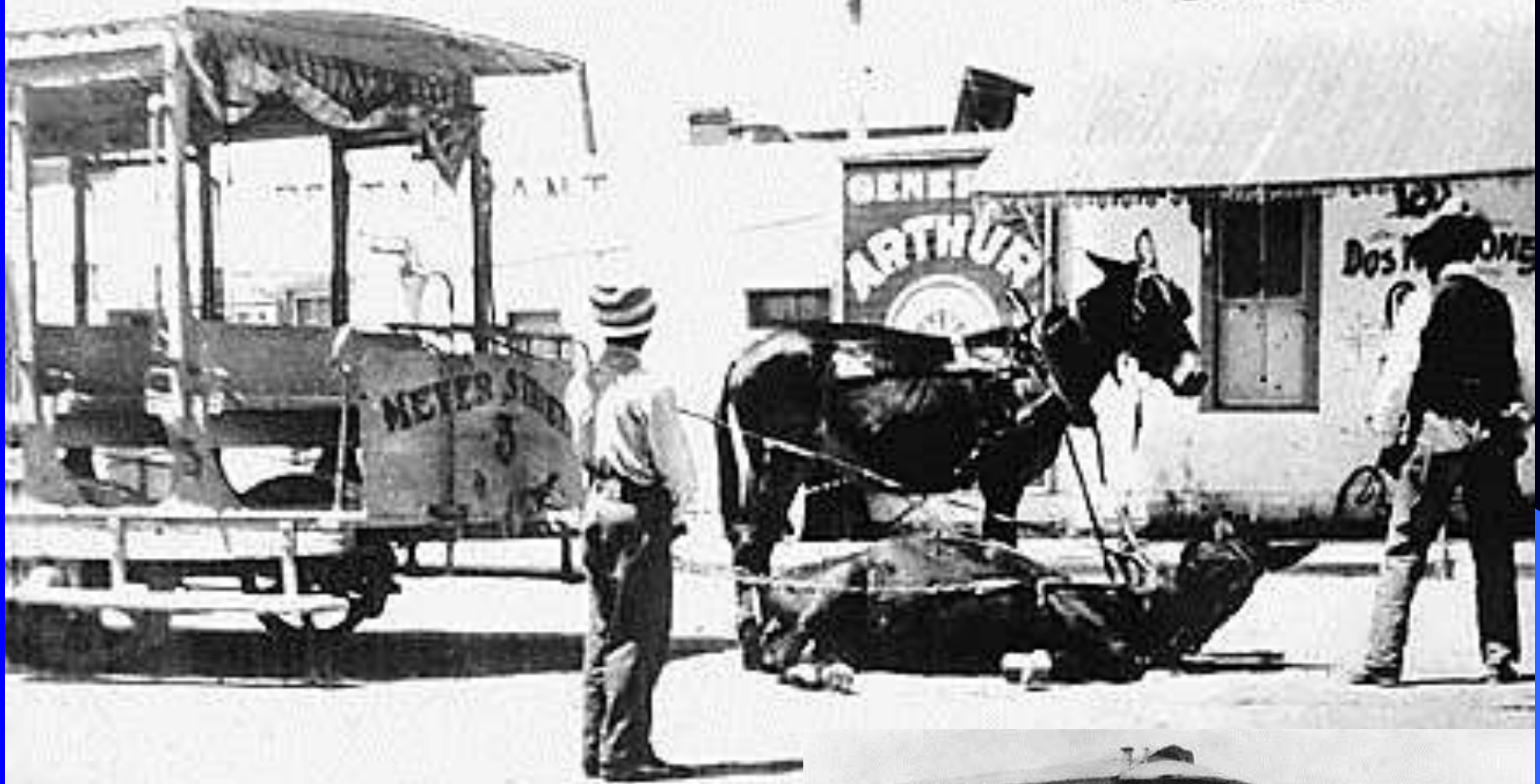


CONTACT US / CONTACTENOS

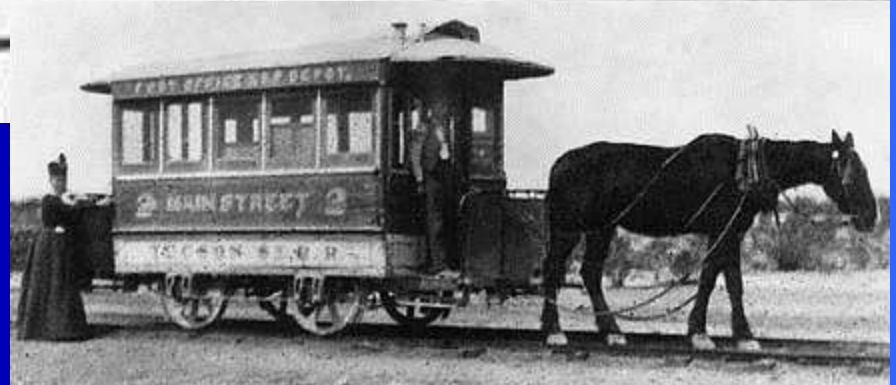
ValleyMetro.org/rail
602-254-RAIL
TTY 602-322-4499
rail@ValleyMetro.org

Information available in alternate format
Información disponible en formatos alternativos

Rail Service



1898

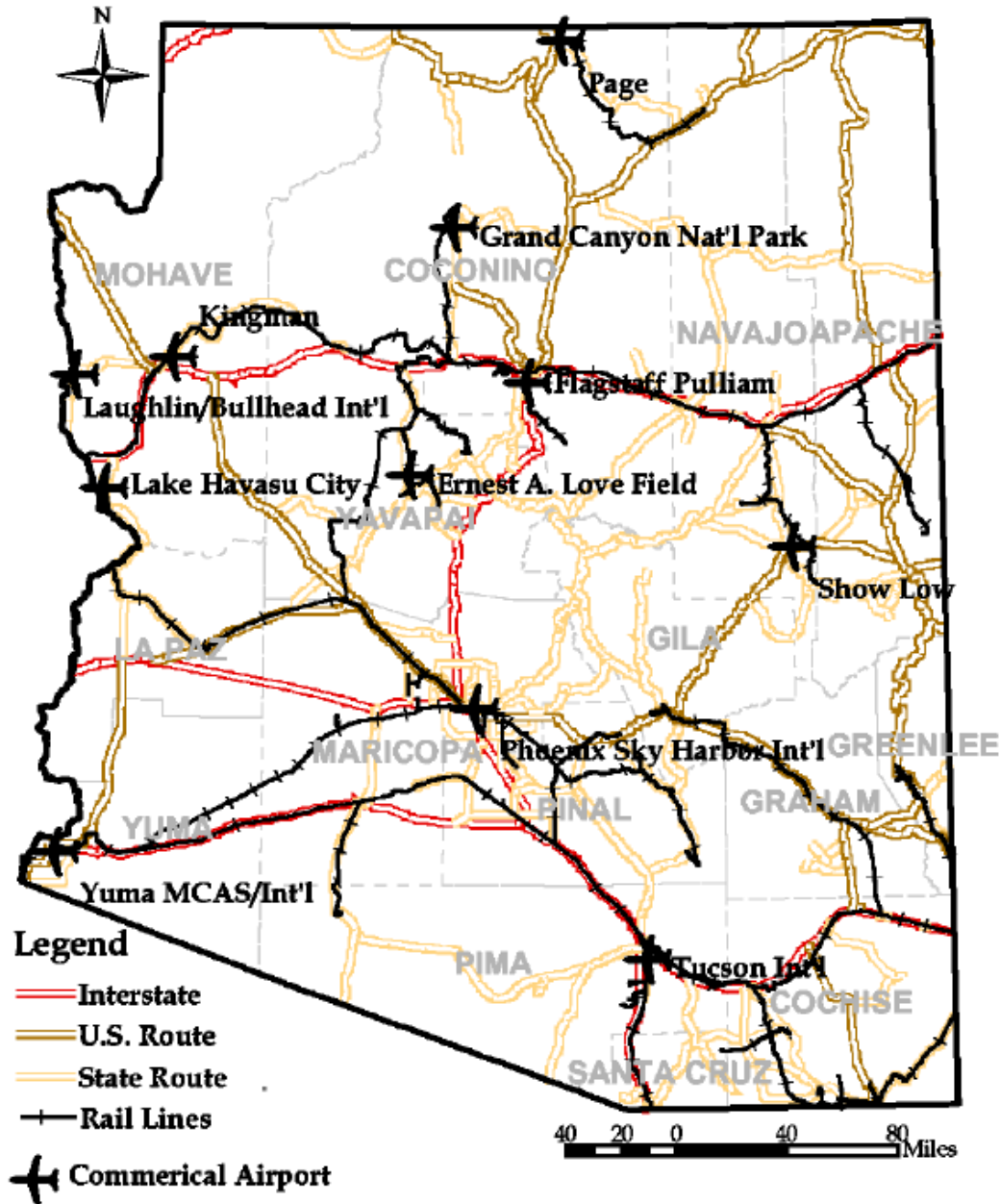




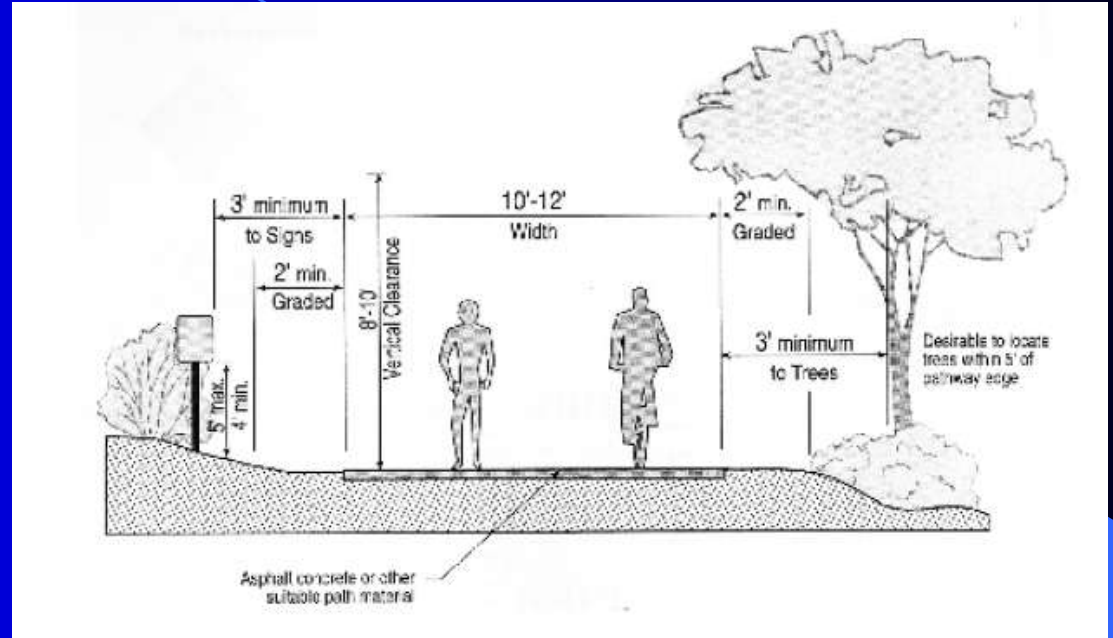
Tucson Modern Streetcar

Figure ES.11 Arizona's Highway, Rail, and Air Transportation System

Arizona Rail & Aviation Network



BICYCLE & PEDESTRIAN PROGRAM



<http://www.azbikeped.org>



Aviation



Phoenix Sky Harbor International Airport accommodates over **555,200** takeoffs and landings annually, making it the **8th busiest airport in the world!**

Figure ES.11 Arizona's Highway, Rail, and Air Transportation System

Arizona Rail & Aviation Network

