WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP
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WESTCARB Annual Business Meeting

Arizona Utilities Saline Formation CO_2 Storage Project: Site Selection

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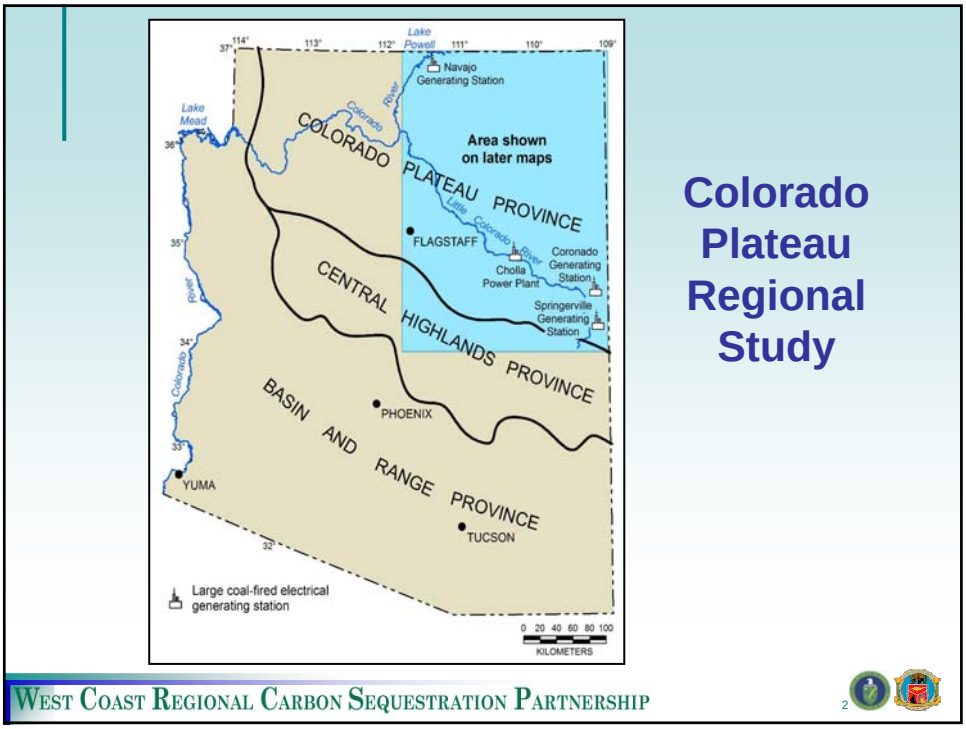
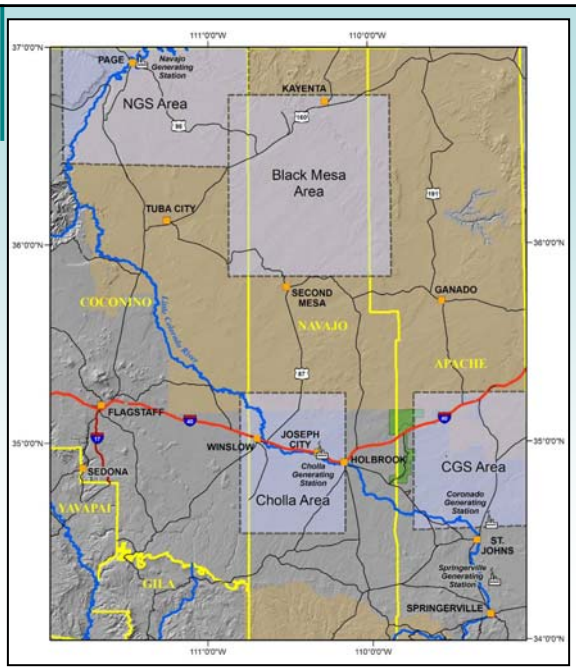


Colorado Plateau Regional Study

Colorado Plateau Province

- 140,000 square miles in Four Corners area
- Thick sequence of laterally extensive, nearly flat-lying sedimentary strata
- Some structural deformation
- Some areas of coal and minor oil and gas accumulations
- Contains 4 large coal-fired power plants
- Has known and probable areas that meet sequestration criteria
- Potential for geologic CO_2 sequestration on production scale

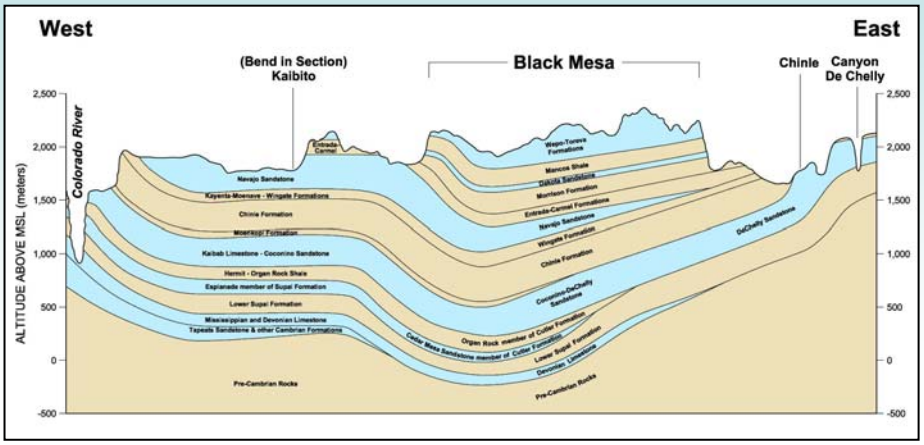


Areas of Interest for Potential Geologic Sequestration of CO_2

EXPLANATION

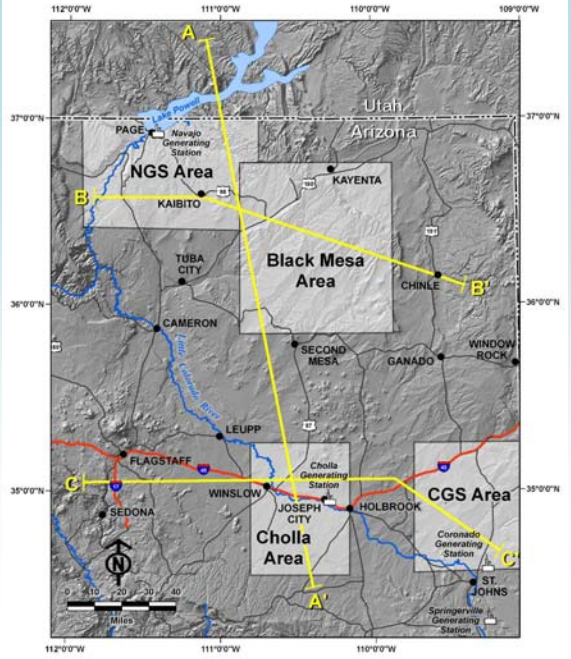
- Petrified Forest
- Tribal Land
- Selected Sub-Areas

Geologic Cross-Section from Colorado River, Through Black Mesa, to Canyon de Chelly



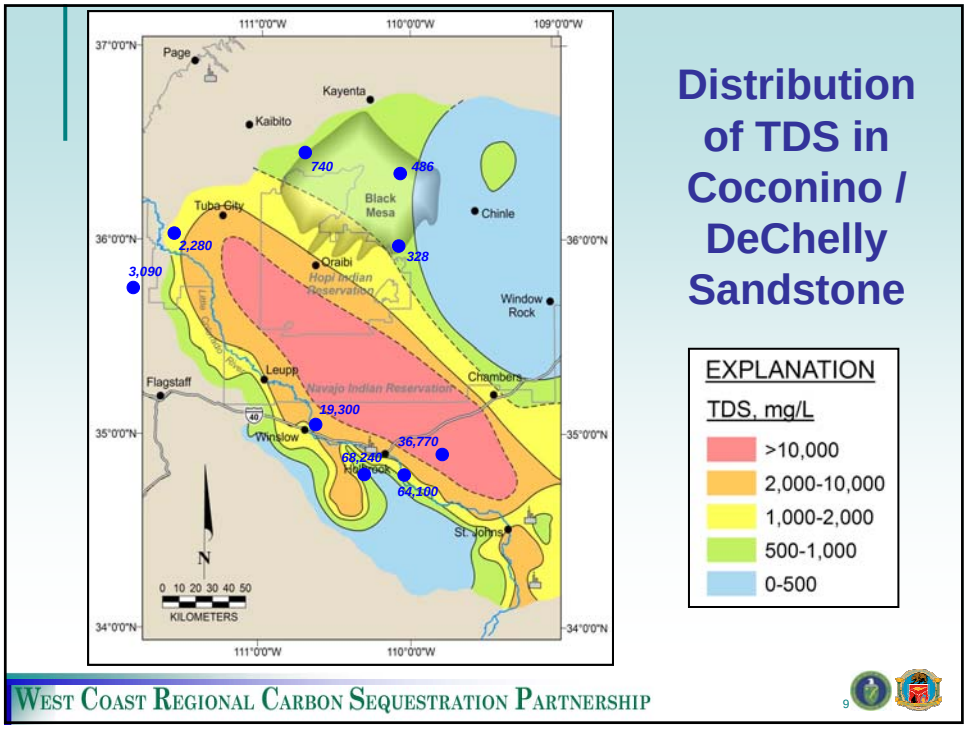
Arizona Demonstration Project

- EPRI Tailored Collaborative program with Salt River Project as lead industrial partner
- Arizona Public Service Company and Tucson Electric Power Company partner in applied research
- Test sequestration potential of deep saline groundwater in Colorado Plateau sediments
- Focus on monitoring



Areas of Interest for Potential Geologic Sequestration of CO2

SUB-AREA	POTENTIAL RESERVOIR AND LITHOLOGY	ESTIMATED DEPTH TO TOP OF UNIT (feet bls)	THICKNESS (feet)	FORMATION PRESSURE (w.r.t. CO_2)	INFERRED POROSITY	EXPECTED WATER QUALITY
Coronado Generating Station	**Lower Supai Fm** siltstone, mudstone, sandstone, evaporites	~ 2,700 (in area northwest of CGS)	800+	likely sub-critical	2 - 5% Primary	highly saline
Cholla Power Plant	**Naco Fm** limestone, sandstone, mudstone	3,200 - 4,100	400 - 500	sub-critical to super-critical	10 - 20% Secondary	saline
	Martin Fm dolomite and limestone, siltstone, mudstone	3,600 - 4,600	400	super-critical	10 - 20% Secondary	saline
Navajo Generating Station	**Cedar Mesa Sandstone** sandstone, siltstone	4,000	300	unknown	15 - 25% Primary	unknown
	Devonian/Mississippian carbonates limestone, dolomite	5,800 - 6,300	800	super-critical	10 - 20% Secondary	unknown
	Tapeats Sandstone medium to coarse sandstone	6,500 - 7,500	300	super-critical	5 - 10% Primary	likely saline
Black Mesa	**Cedar Mesa Sandstone** sandstone, siltstone	4,500 - 5,500	300	unknown	15 - 25% Primary	unknown
	Devonian/Mississippian carbonates limestone, dolomite	5,500 - 6,500	800	super-critical	10 - 20% Secondary	unknown
	Tapeats Sandstone medium to coarse sandstone	6,300 - 7,300	250	super-critical	5 - 10% Primary	likely saline


Distribution of TDS in Coconino / DeChelly Sandstone
111°0'0"W
110°0'0"W
109°0'0"W
37°0'0"N
36°0'0"N
35°0'0"N
34°0'0"N
Page
Kayenta
Kaibito
Tuba City
Black Mesa
Chinle
Oraibi
Hopi Indian Reservation
Window Rock
Leupp
Flagstaff
Navajo Indian Reservation
Chambers
Winslow
Holbrook
St. Johns
740
486
2,280
328
3,090
19,300
36,770
68,240
64,100
N
0 10 20 30 40 50
KILOMETERS
EXPLANATION
TDS, mg/L
>10,000
2,000-10,000
1,000-2,000
500-1,000
0-500
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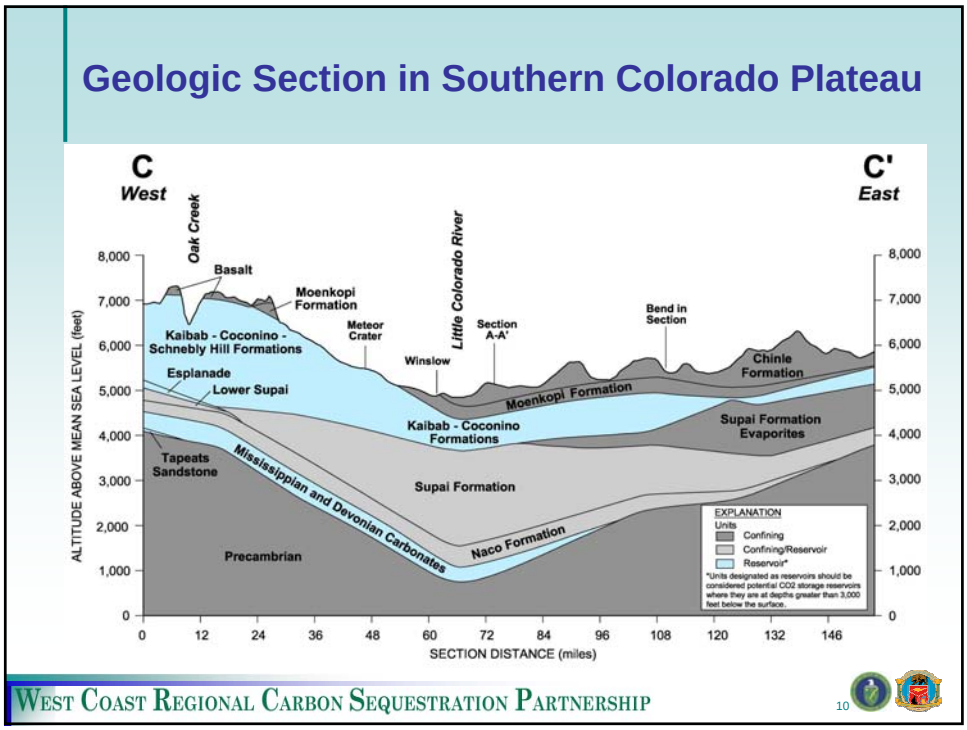
Geologic Section in Southern Colorado Plateau
C
West
C'
East
Oak Creek
Little Colorado River
Basalt
Moenkopi Formation
Kaibab - Coconino - Schnebly Hill Formations
Meteor Crater
Winslow
Section A-A'
Bend in Section
Chinle Formation
Esplanade
Lower Supai
Moenkopi Formation
Kaibab - Coconino Formations
Supai Formation Evaporites
Tapeats Sandstone
Mississippian and Devonian Carbonates
Supai Formation
Naco Formation
Precambrian
ALTITUDE ABOVE MEAN SEA LEVEL (feet)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
0
12
24
36
48
60
72
84
96
108
120
132
146
SECTION DISTANCE (miles)
EXPLANATION
Units
Confining
Confining/Reservoir
Reservoir*
*Units designated as reservoirs should be considered potential CO2 storage reservoirs where they are at depths greater than 3,000 feet below the surface.
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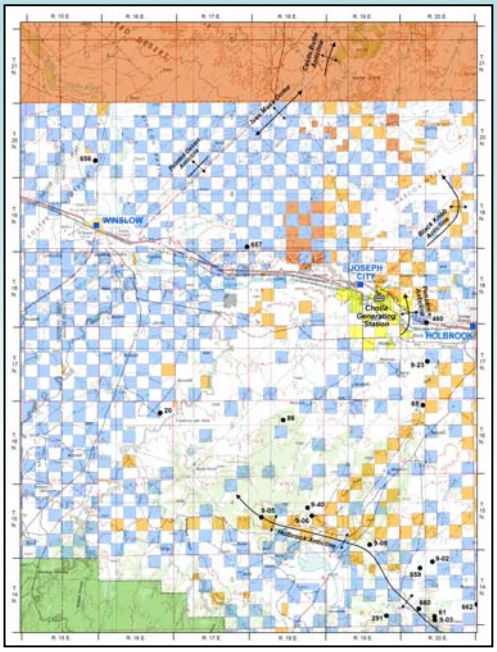
Potential Geologic CO_2 Sequestration in the Cholla Area

- Potential reservoirs in Naco and Martin Formations for supercritical CO_2 storage
- Primary porosity and permeability development due to near-shore depositional environment
- Extensive confining layer to seal upward CO_2 migration
- Limited land use/seismically stable area
- Limited number of deep wells in area
- Likely area of poor quality groundwater
- Candidate site for demonstration project

Land Ownership in Cholla Area



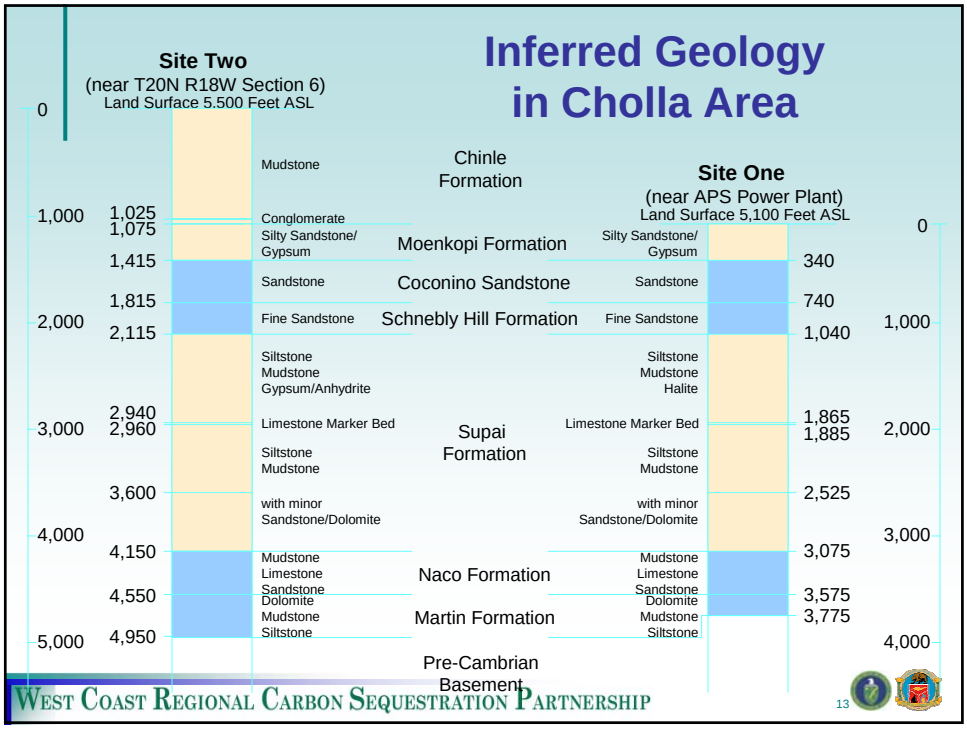
EXPLANATION

291 Oil and Gas Deep Well (>3,000 foot total depth) — Oil and Gas Commission Permit Number

Anticline

LAND STATUS

- APS
- BLM
- Forest
- State Trust
- Indian Res.
- Private
- Other


Inferred Geology in Cholla Area
Site Two
(near T20N R18W Section 6)
Land Surface 5,500 Feet ASL
Site One
(near APS Power Plant)
Land Surface 5,100 Feet ASL
0
1,000
2,000
3,000
4,000
5,000
1,025
1,075
1,415
1,815
2,115
2,940
2,960
3,600
4,150
4,550
4,950
Mudstone
Conglomerate
Silty Sandstone/ Gypsum
Sandstone
Fine Sandstone
Siltstone Mudstone Gypsum/Anhydrite
Limestone Marker Bed
Siltstone Mudstone with minor Sandstone/Dolomite
Mudstone Limestone Sandstone
Dolomite Mudstone Siltstone
Chinle Formation
Moenkopi Formation
Coconino Sandstone
Schnebly Hill Formation
Supai Formation
Naco Formation
Martin Formation
Pre-Cambrian Basement
Silty Sandstone/ Gypsum
Sandstone
Fine Sandstone
Siltstone Mudstone Halite
Limestone Marker Bed
Siltstone Mudstone with minor Sandstone/Dolomite
Mudstone Limestone Sandstone
Dolomite Mudstone Siltstone
0
340
740
1,040
1,865
1,885
2,525
3,075
3,575
3,775
1,000
2,000
3,000
4,000
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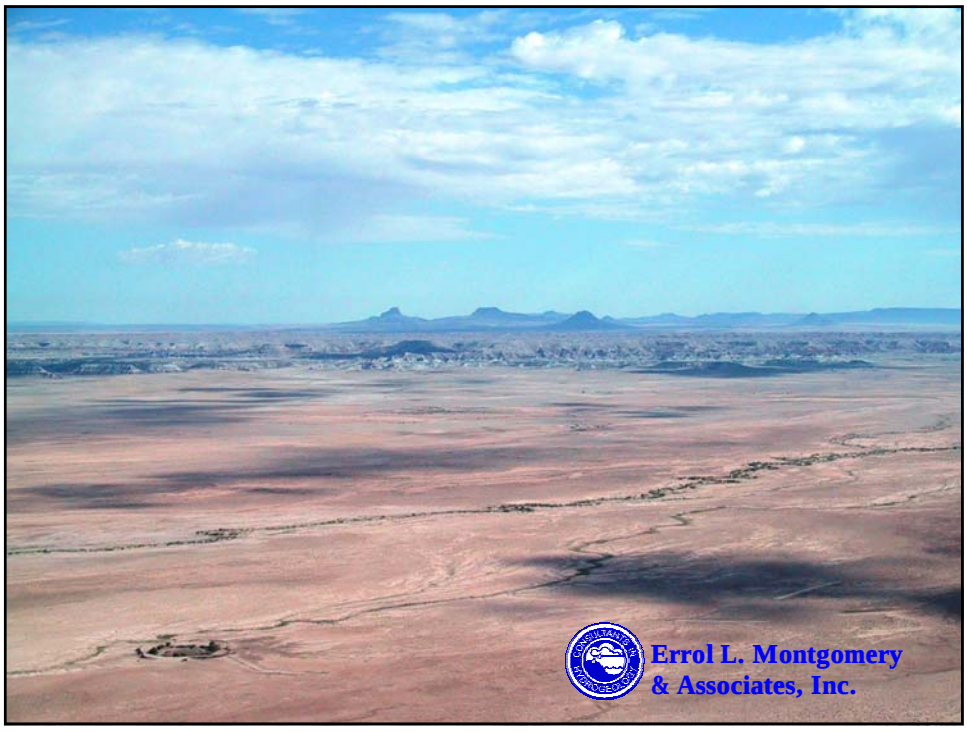
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