



# Permitting and Regulatory Issues Compilation

## State-by-State Analysis for Geologic (Transportation and Injection) and Terrestrial Sequestration

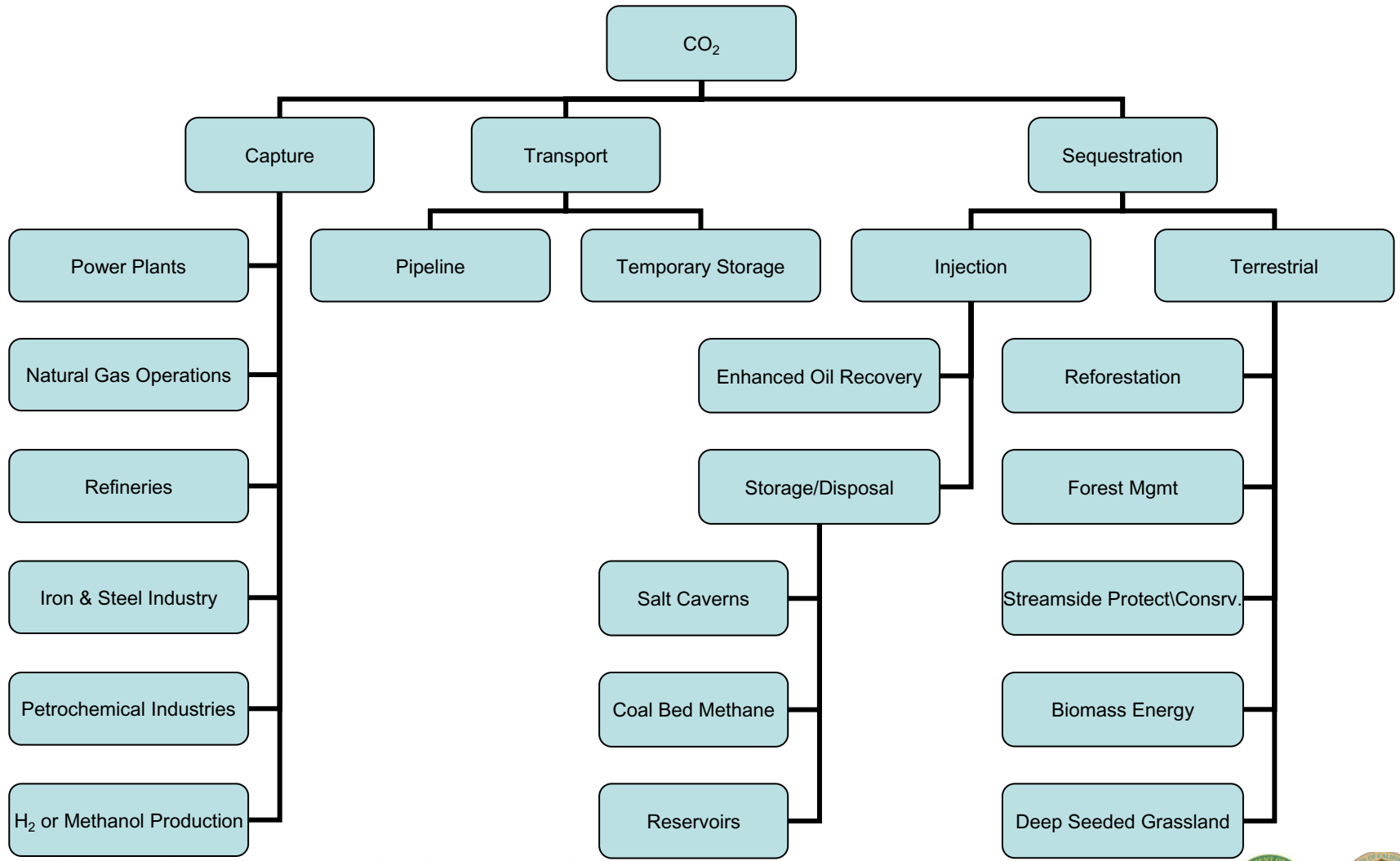
*Jean Young, Mike Bruno*  
Terralog Technologies USA, Inc.  
Arcadia, CA

*August 2005*

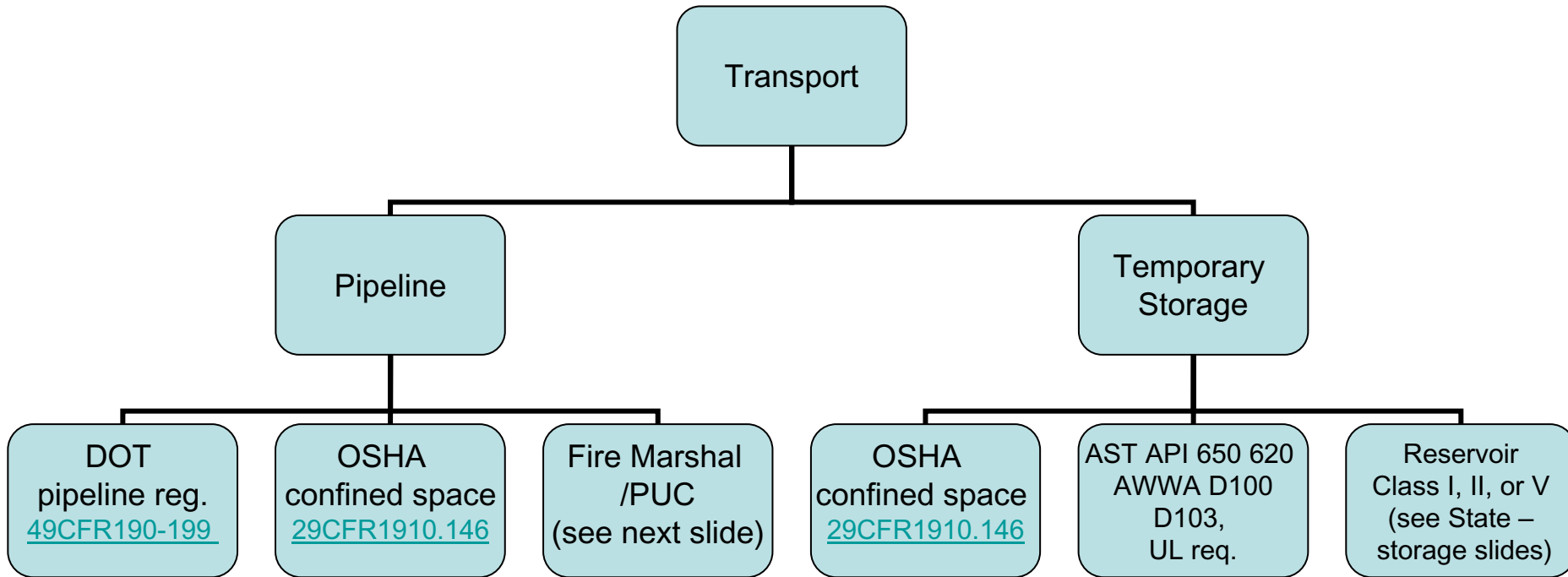


# CO<sub>2</sub> From Capture to Sequestration

West Coast Regional Carbon Sequestration Partnership



# CO<sub>2</sub> Transport



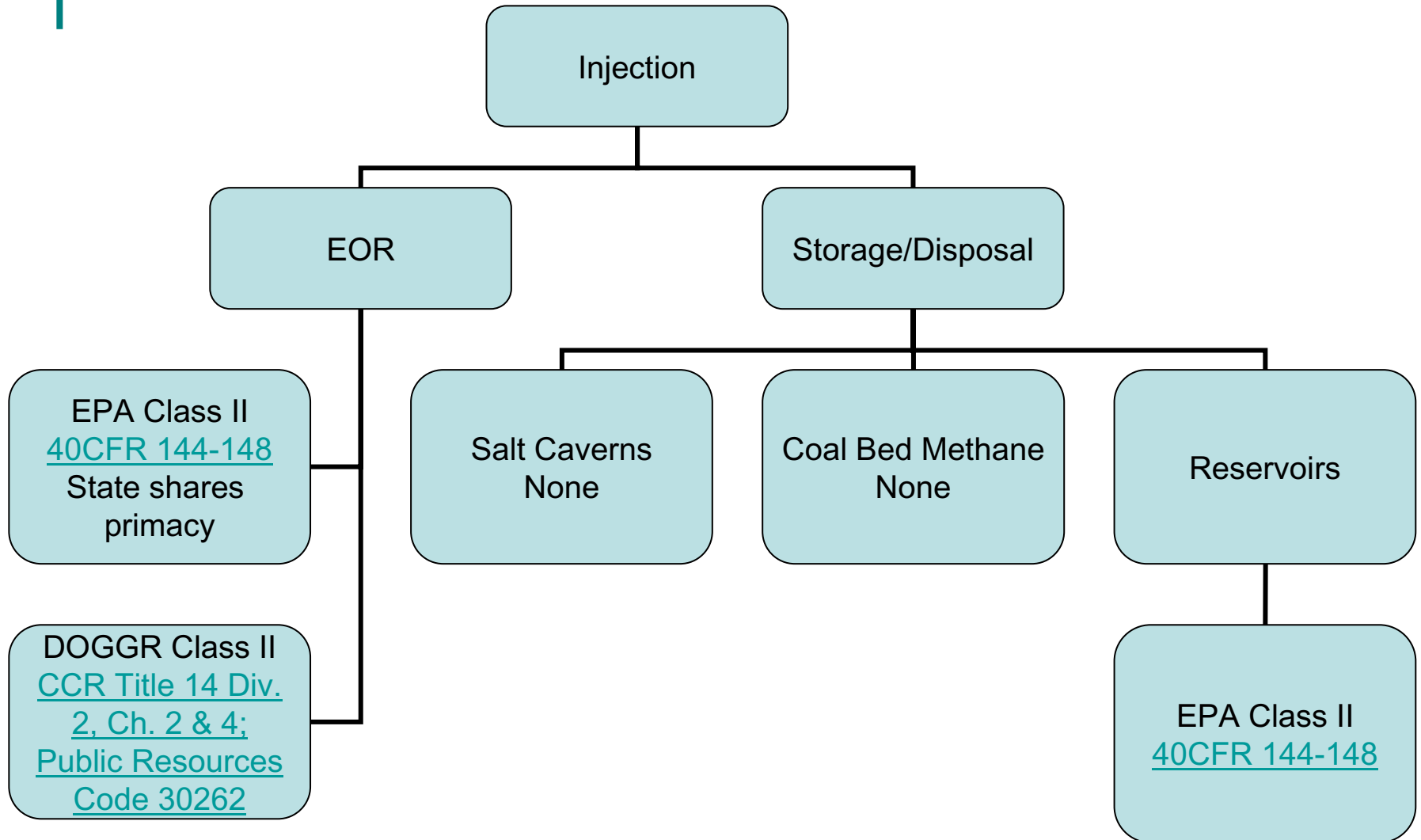
# Fire Marshal/PUC State Regulations

- AK defers to DOT [49CFR 195](#)
- AZ ACC, [R14-5-201 to R14-5-205](#)
- CA Fire Marshal [Gov Code Sec 51010 to 51019.1](#), [AB 592](#), [DOG Pipeline](#) regulations
- NV PSC [NAC 704.455 to 704.465](#), [DOT 49CFR 195](#)
- OR [PUC Div 31 860-031-0001 to 860-031-0040](#), [DOT 49CFR 195](#)
- WA [UTC ESSHB 2420 Ch 191 Laws of 2000](#), [RCW Ch 81.11](#), [DOT 49CFR 195](#)

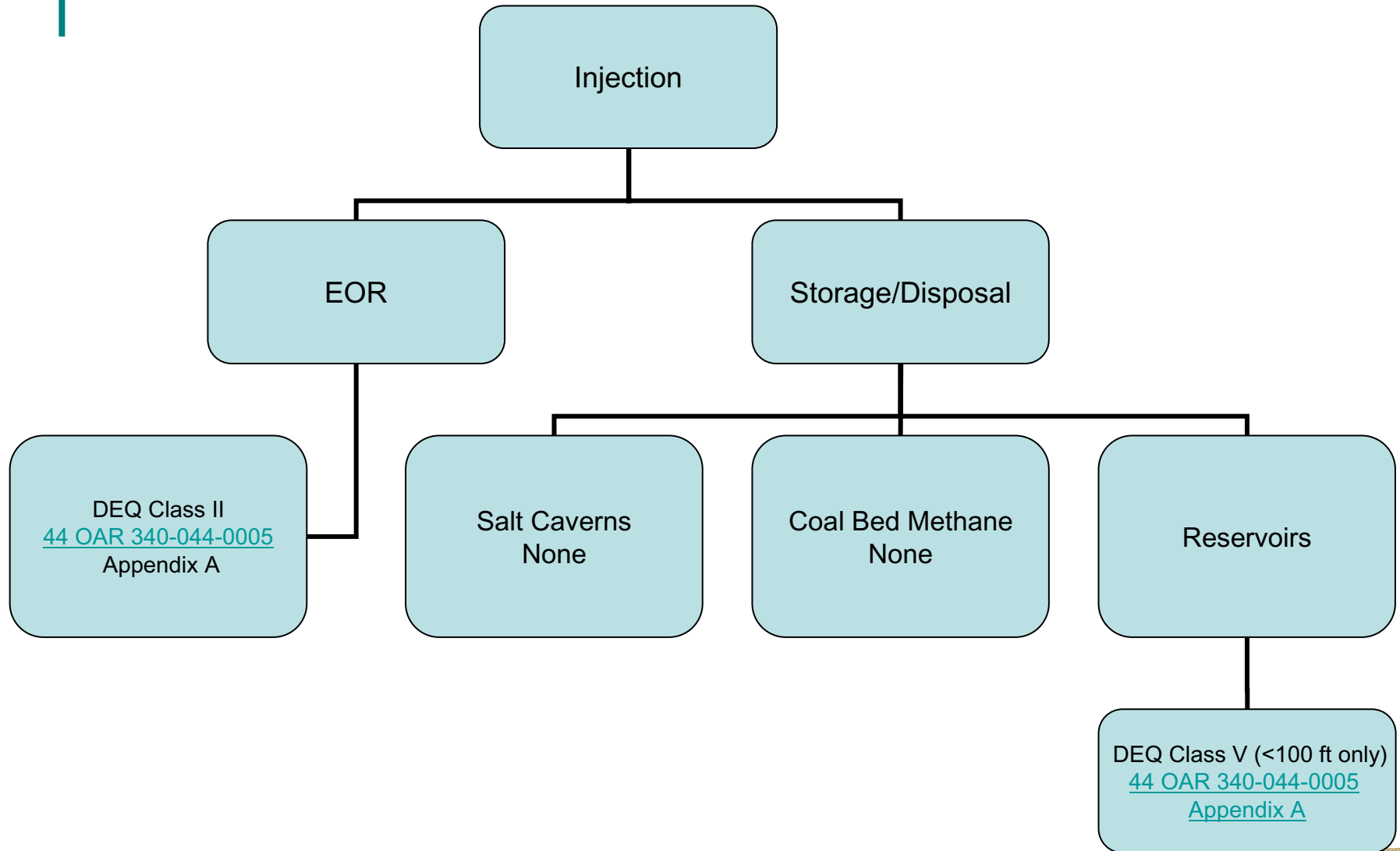
# CO<sub>2</sub> Injection Classification Definition

- Definition of CO<sub>2</sub> as waste or product to be decided by EPA and states. Classification is of lesser importance than regulatory operations concern.
- EOR wells as Class II – classified as product in 6 states
- Salt Cavern – AZ Class I
- Coalbed Methane (not related to EOR)– AZ Class I  
AK Class V  
WA Class V

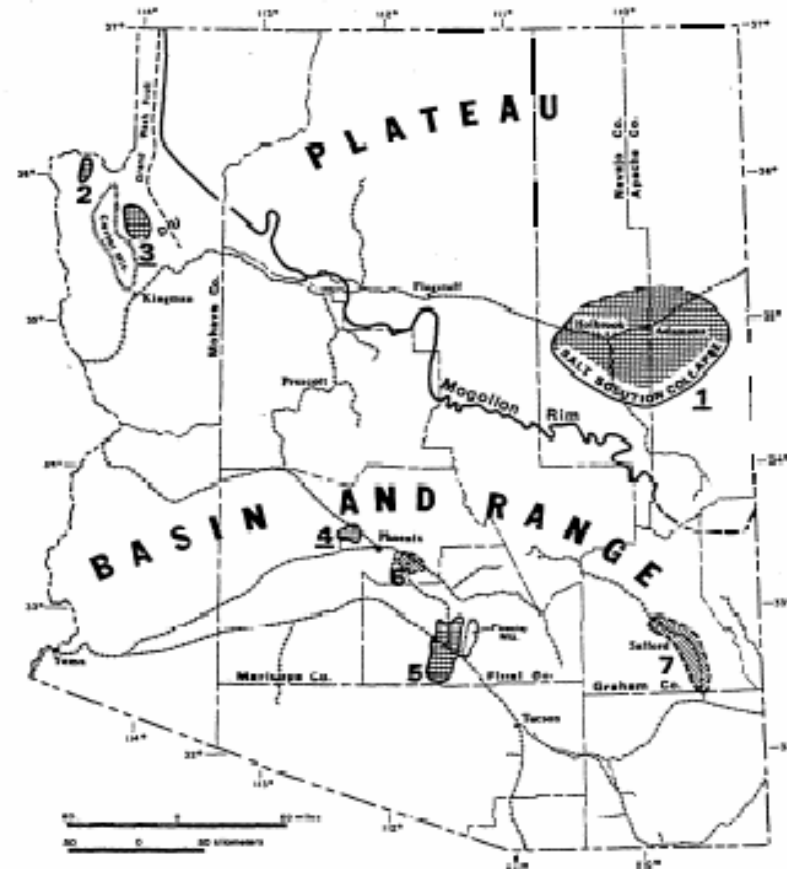
# California Injection Options



# Oregon Injection Options



# Arizona Salt Deposits



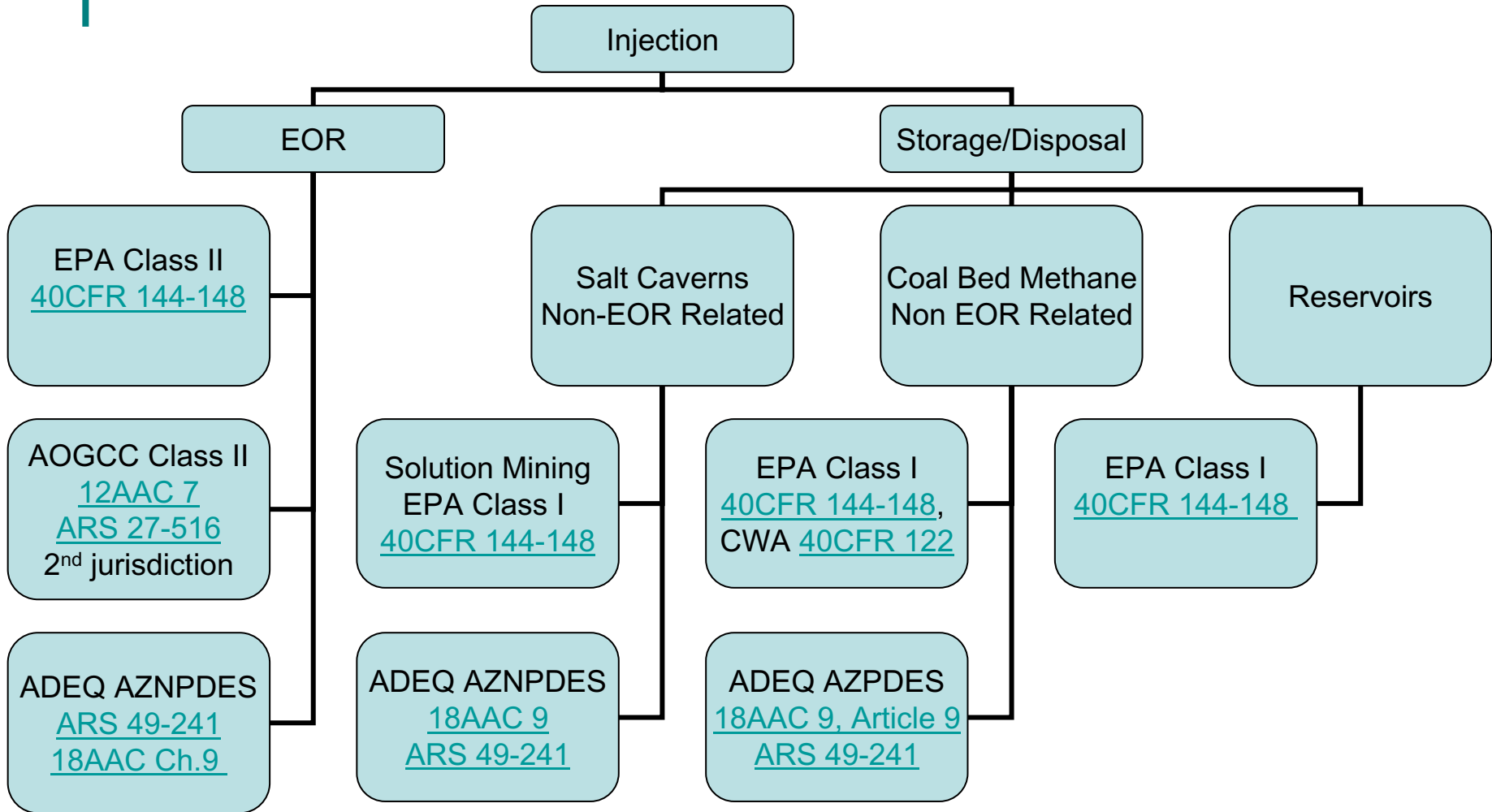
### EXPLANATION

- |                          |                    |                                   |
|--------------------------|--------------------|-----------------------------------|
| 1 - Mohave Basin salt    | 5 - Pinalco Basin  | - Large salt deposits known       |
| 2 - Coconino Valley salt | 6 - Highley Basin  | - Large salt deposits probable    |
| 3 - Wood Lake Basin salt | 7 - Safford Valley | - Exploration (actual or planned) |
| 4 - Luke Basin salt      |                    |                                   |

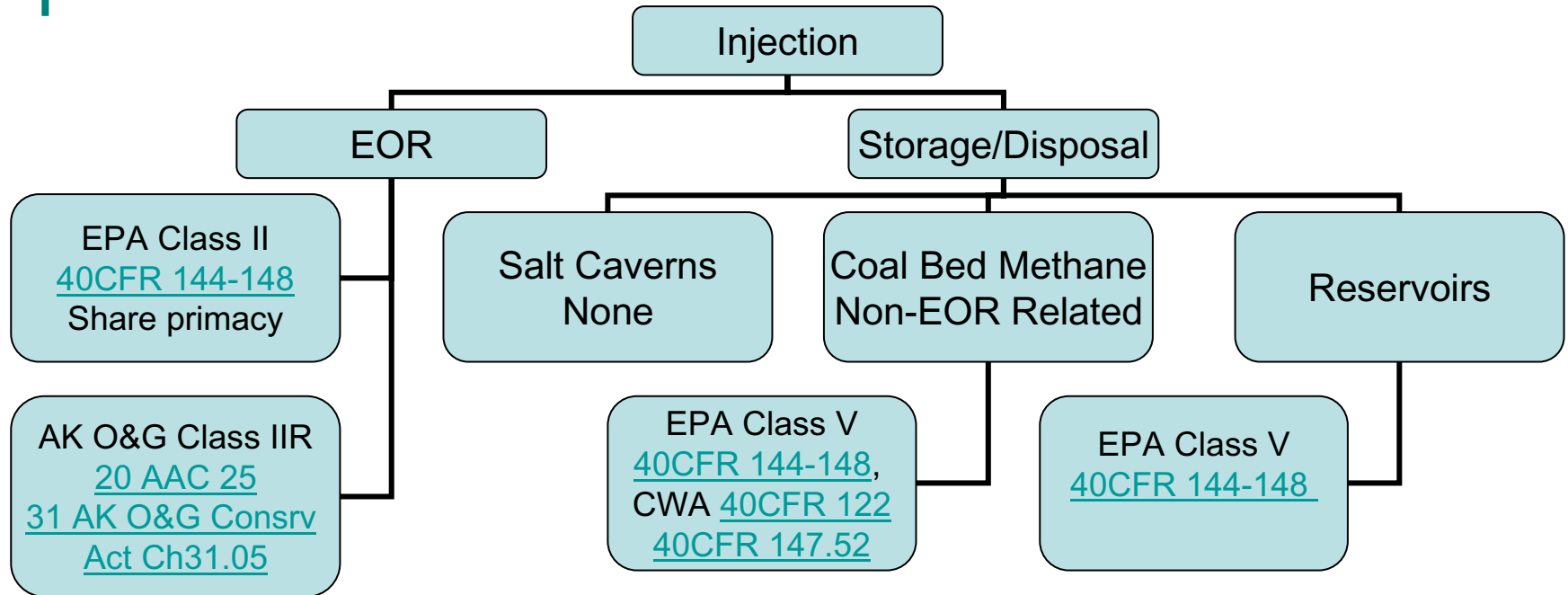
Source: Neal, J.T., 1996,  
Storage Opportunities in AZ  
Bedded Evaporites,  
SMRI

Figure 1, Index to Arizona Salt Deposits and Location of Railroads.

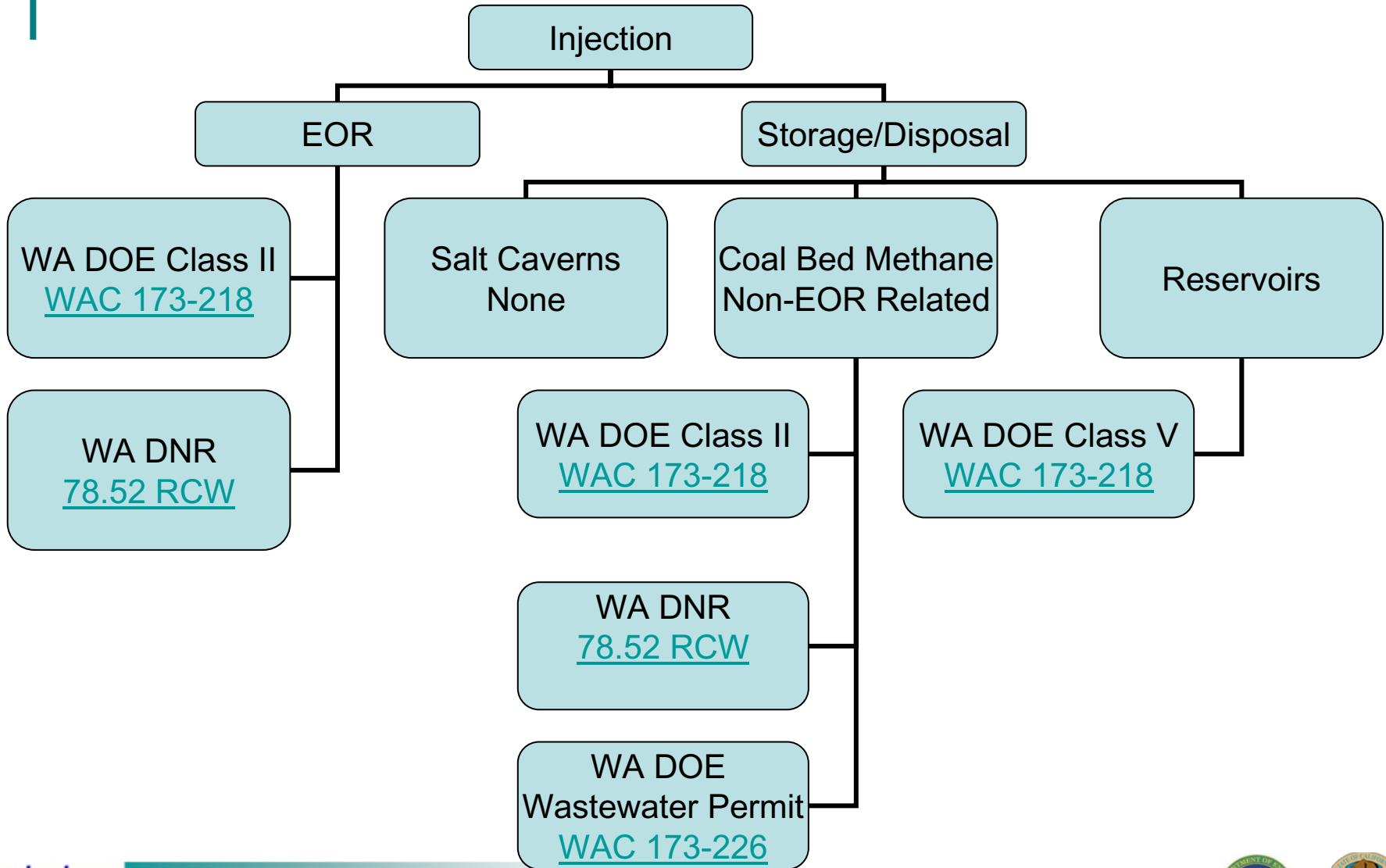
# Arizona Injection Options



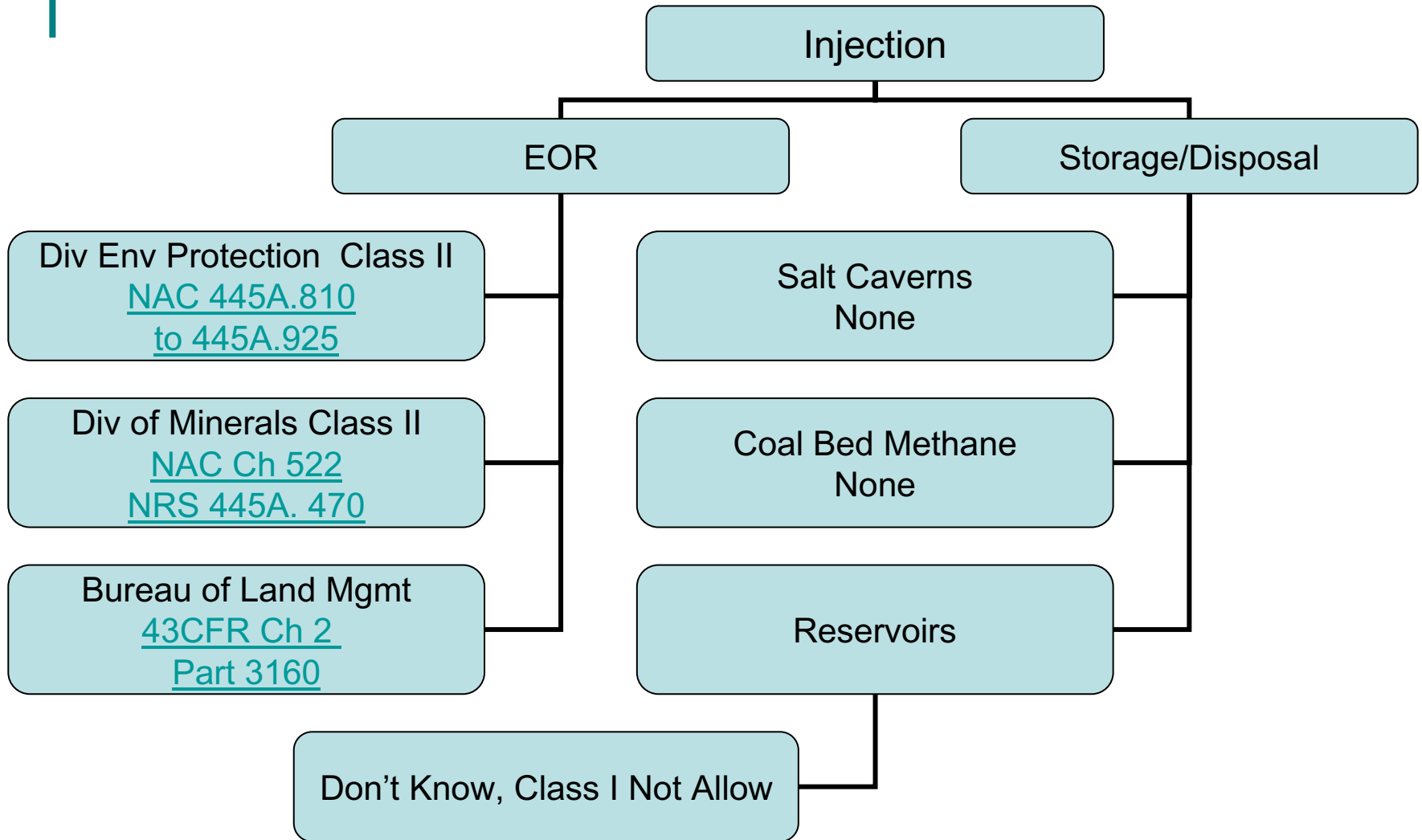
# Alaska Injection Options



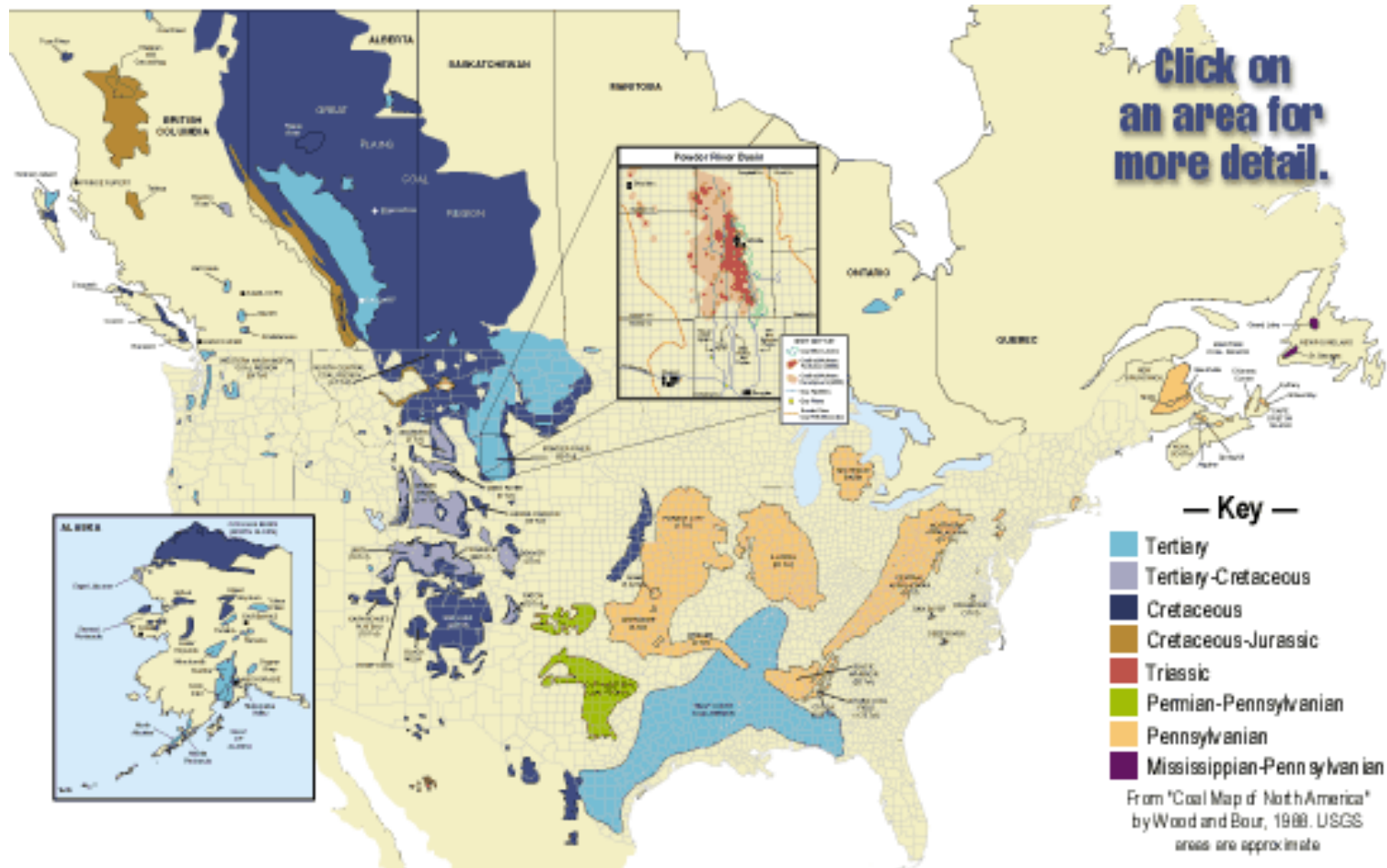
# Washington Injection Options



# Nevada Injection Options



# North America Coal Bed Methane Resource Map



Source: Hart's E&Pnet – GTI  
[www.eandpnet.com/cbm](http://www.eandpnet.com/cbm)

# Terrestrial CO<sub>2</sub> Strategies

- Carbon conservation
  - Maintain forest land base (e.g., forest reserves and conservation)
  - Reduced deforestation
  - Modified forest management (e.g., extending rotation)
  - Reduced degradation (e.g., protect forests from fires and pests)
- Carbon substitution
  - Biomass for energy generation
  - Substitution for fossil-fuel-based products
  - Urban forestry (e.g., energy conservation)
- Carbon sequestration and storage
  - Afforestation/reforestation
  - Urban forestry (e.g., carbon storage through tree growth)
  - Agroforestry
  - Forest management (include commercial forestry)

Source: Vine, Edward, 2003, *Regulatory Constraints to Carbon Sequestration in Terrestrial Ecosystems and Geologic Formations: A California Perspective*

# Top 4 Terrestrial CO<sub>2</sub> Sequestration Options

- Reforestation of under-producing lands (include streamside forest restoration)
- Forest management
- Forest protection and conservation
- Hazard wildfire fuel treatments/Biomass energy

# Federal Land Management

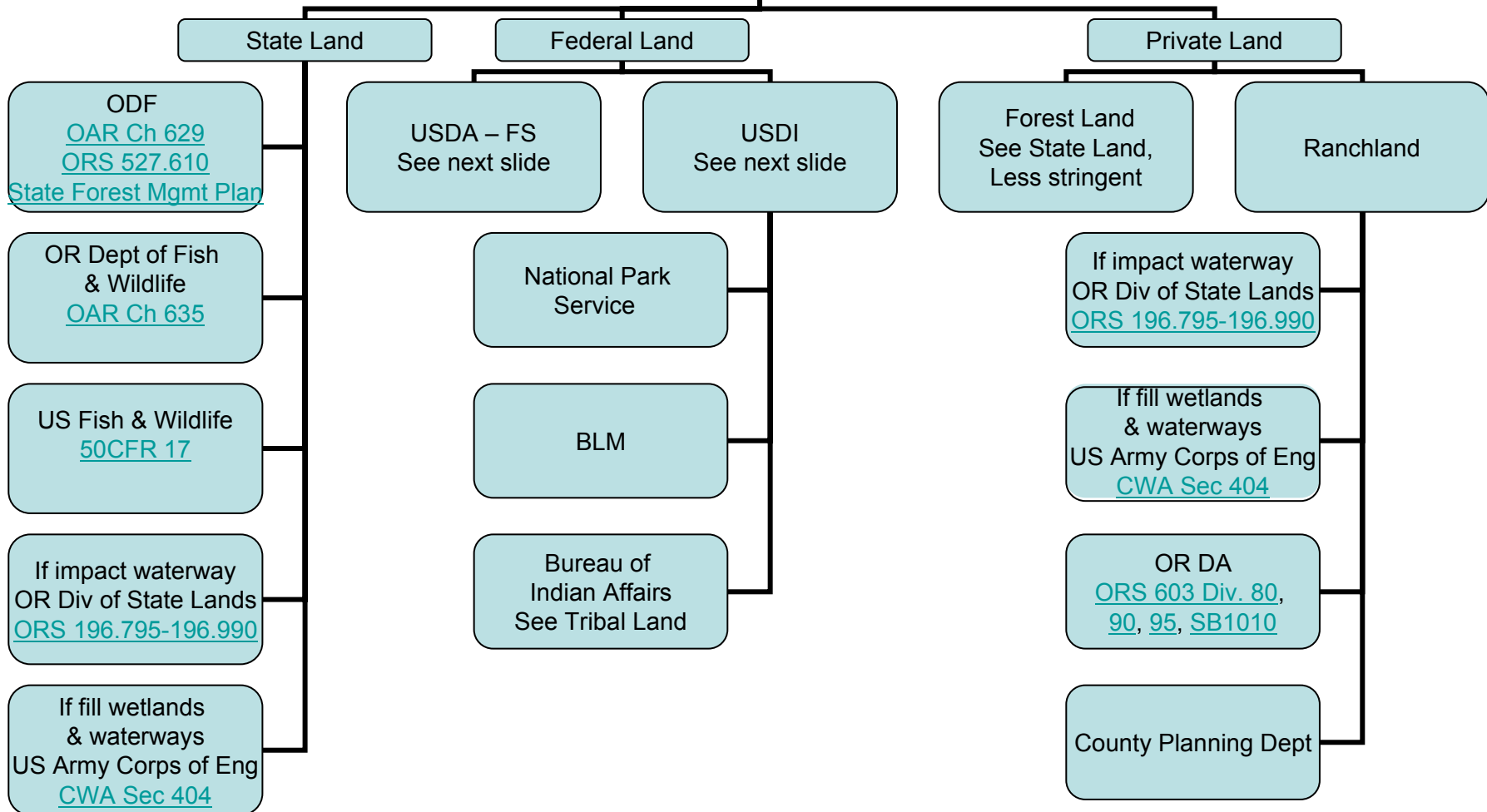
- U.S. Dept. of Agriculture
  - Forest Service
- U.S. Dept. of Interior
  - Bureau of Land Management
  - National Park Service

# Tribal Land Management

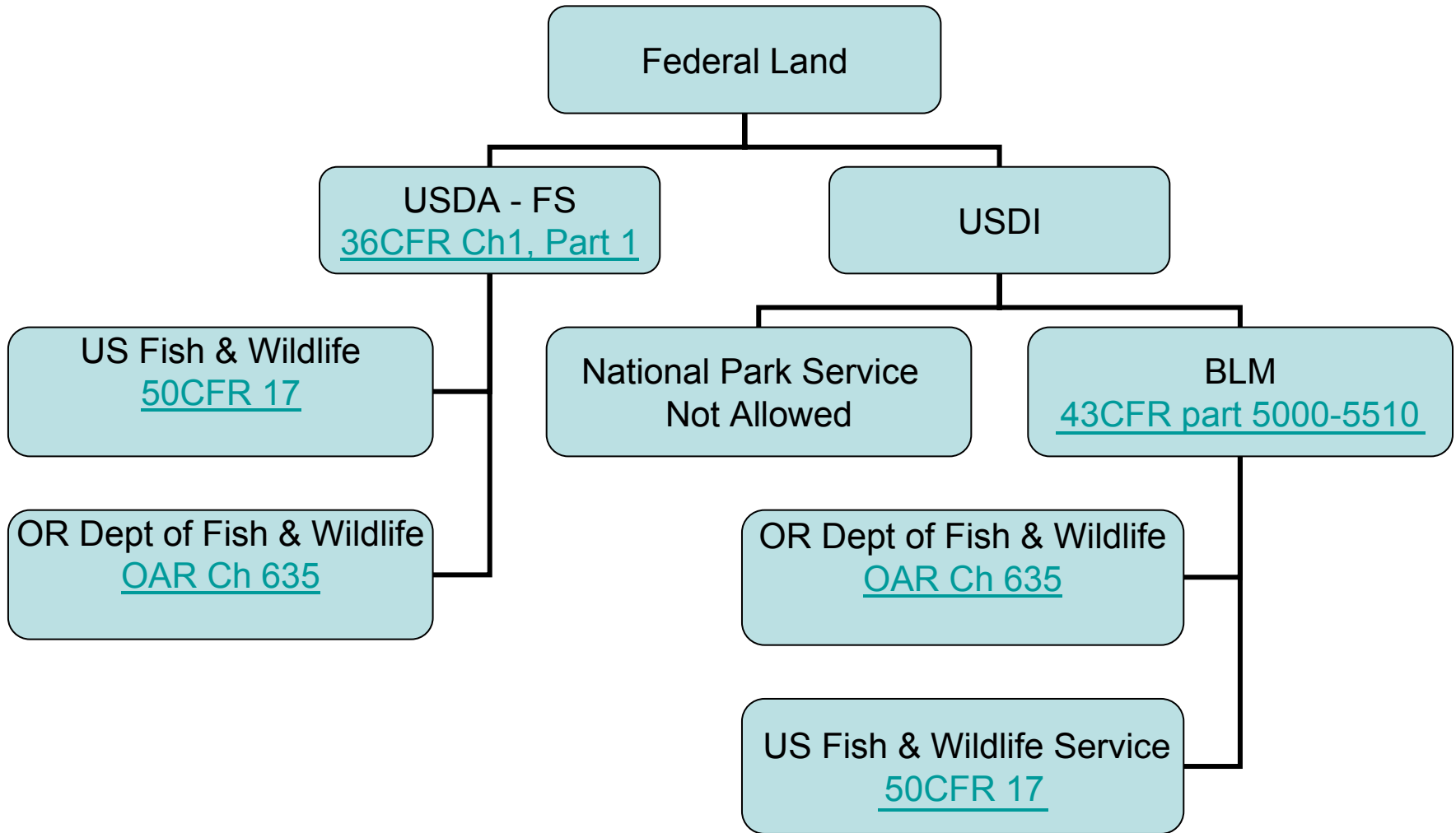
- Sovereign Tribal Government
- U.S. Dept. of Interior
  - Bureau of Indian Affairs

# Oregon Terrestrial Options

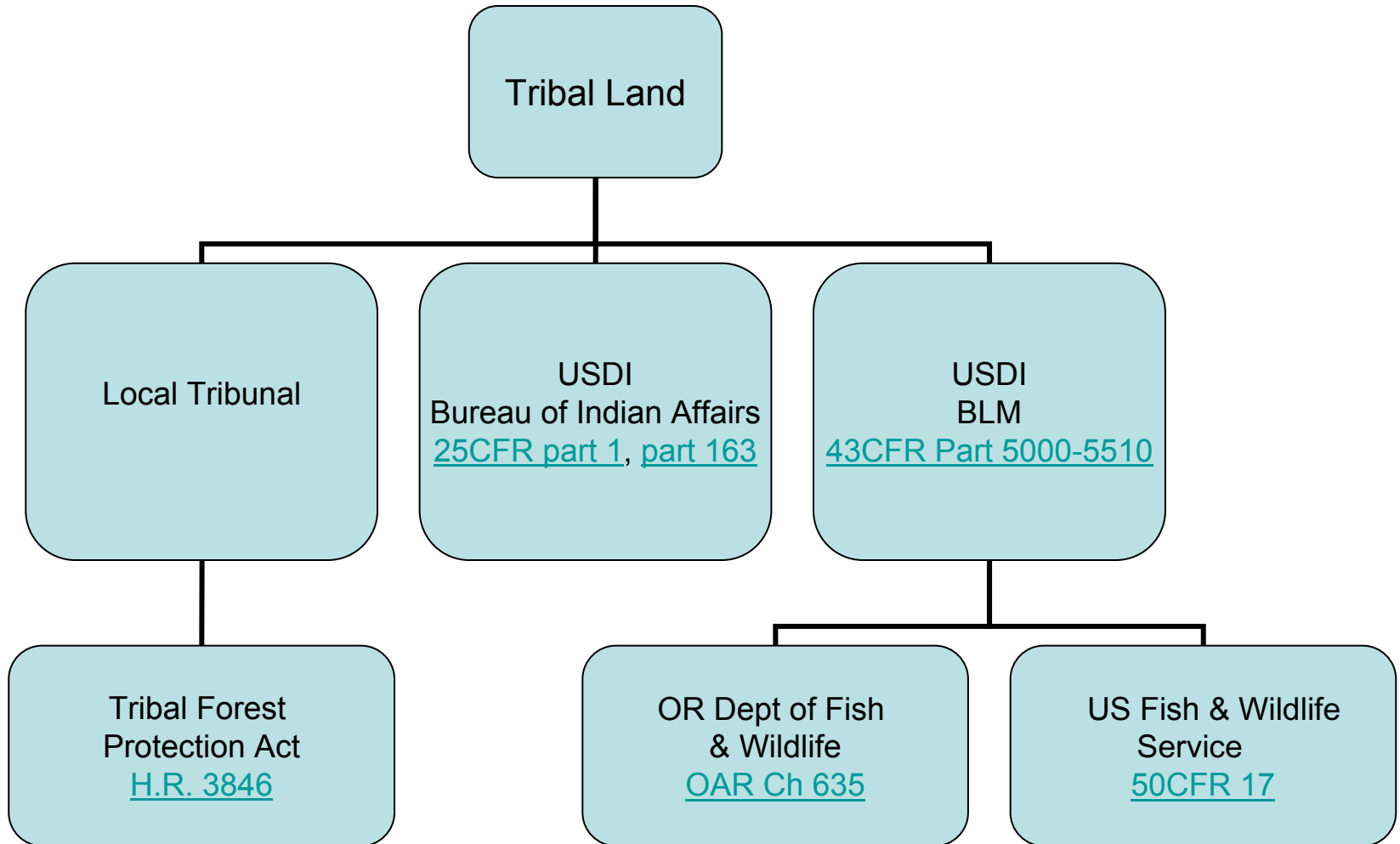
Any Change/Gd. Disturbance/  
Forest Mgmt. Forestation,  
Riparian Conservation



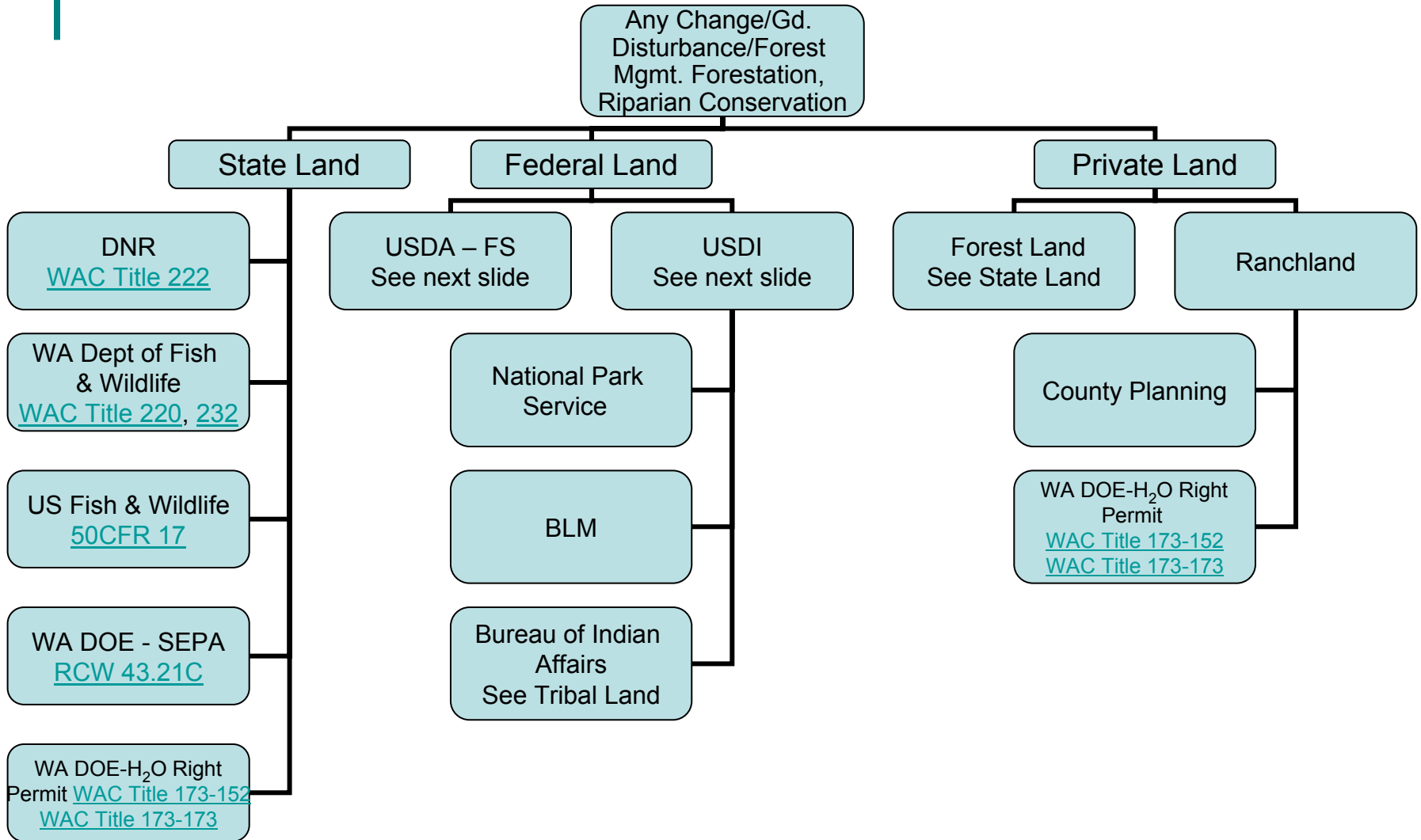
# Oregon Federal Land



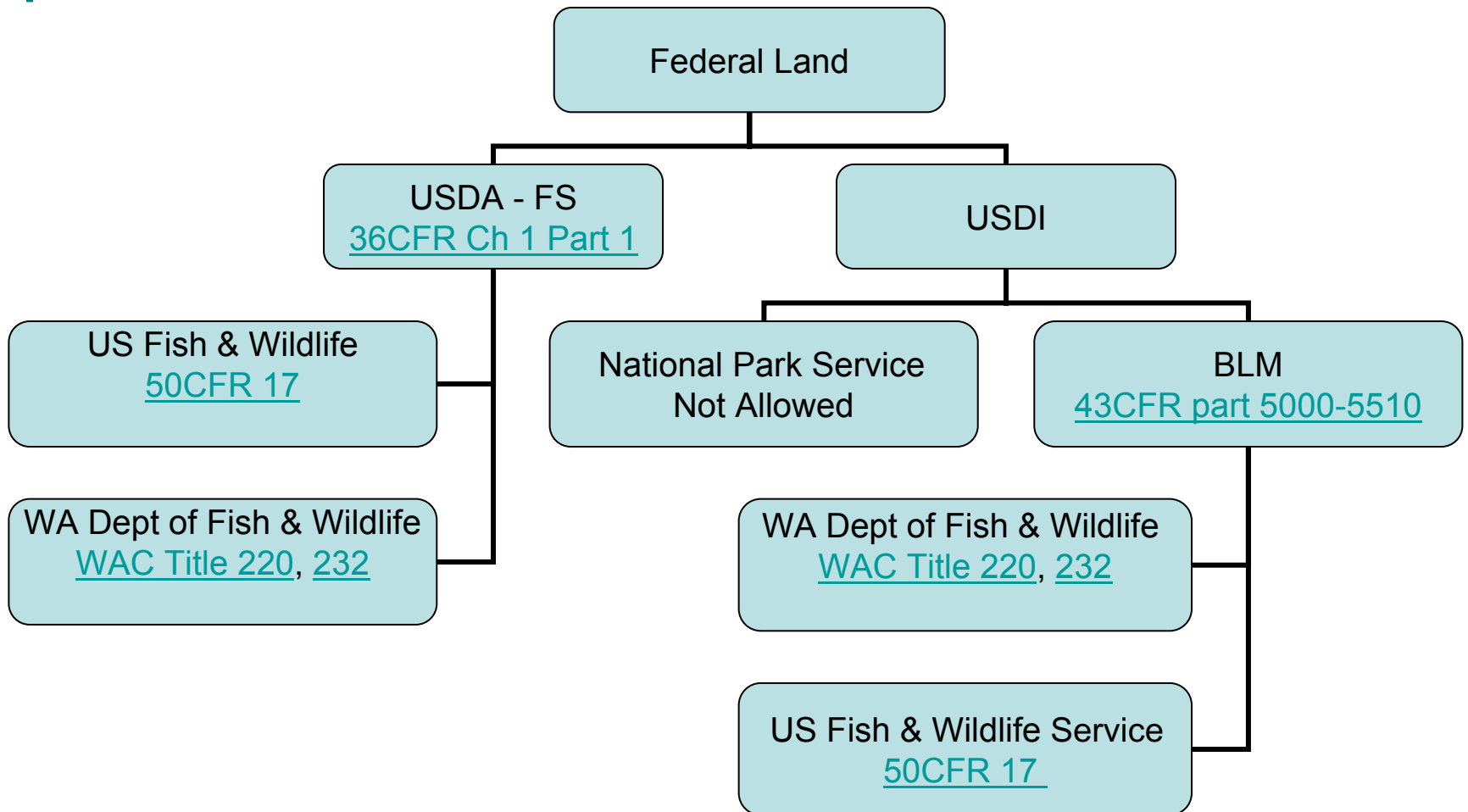
# Tribal Land



# Washington Terrestrial Options

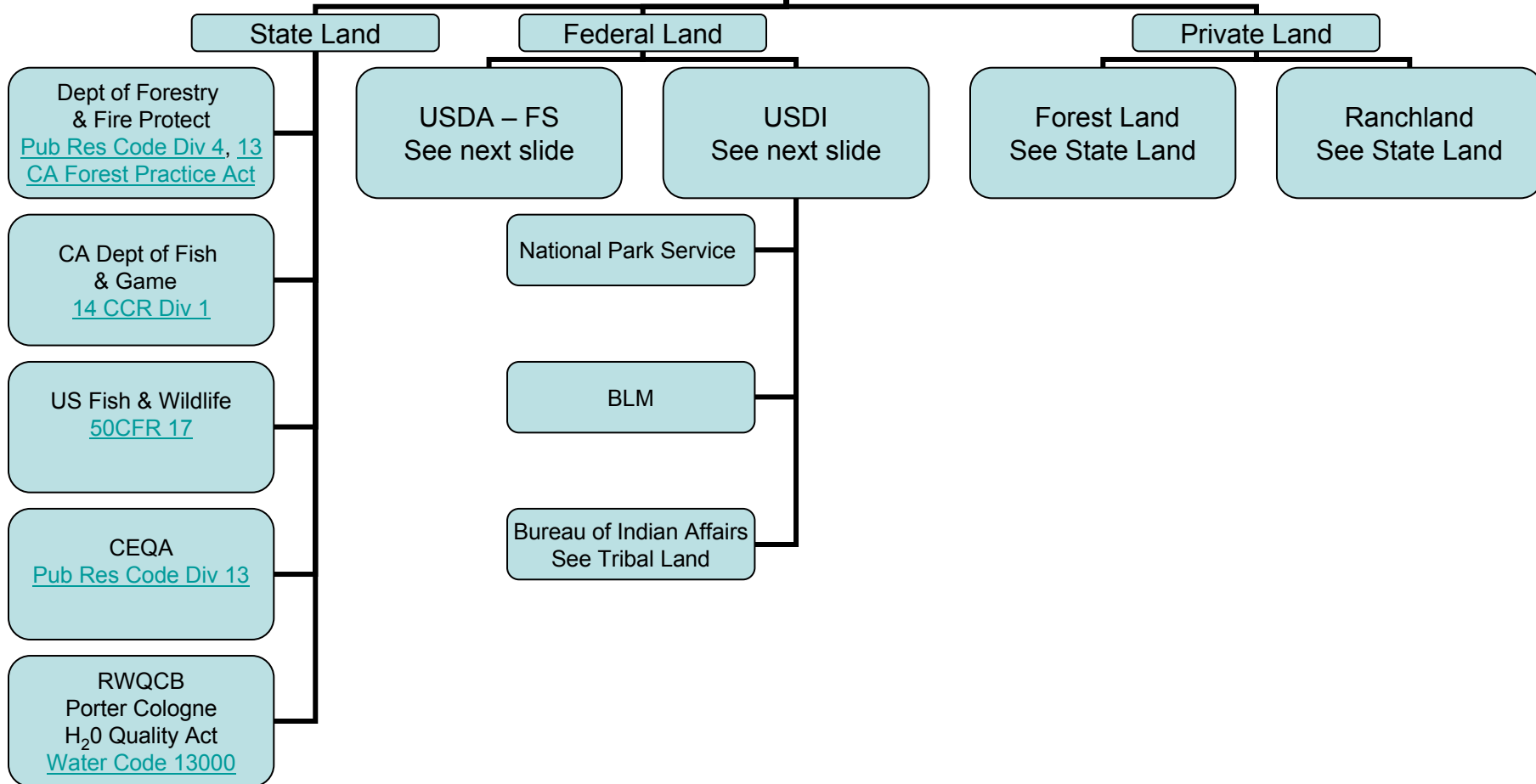


# Washington Federal Land

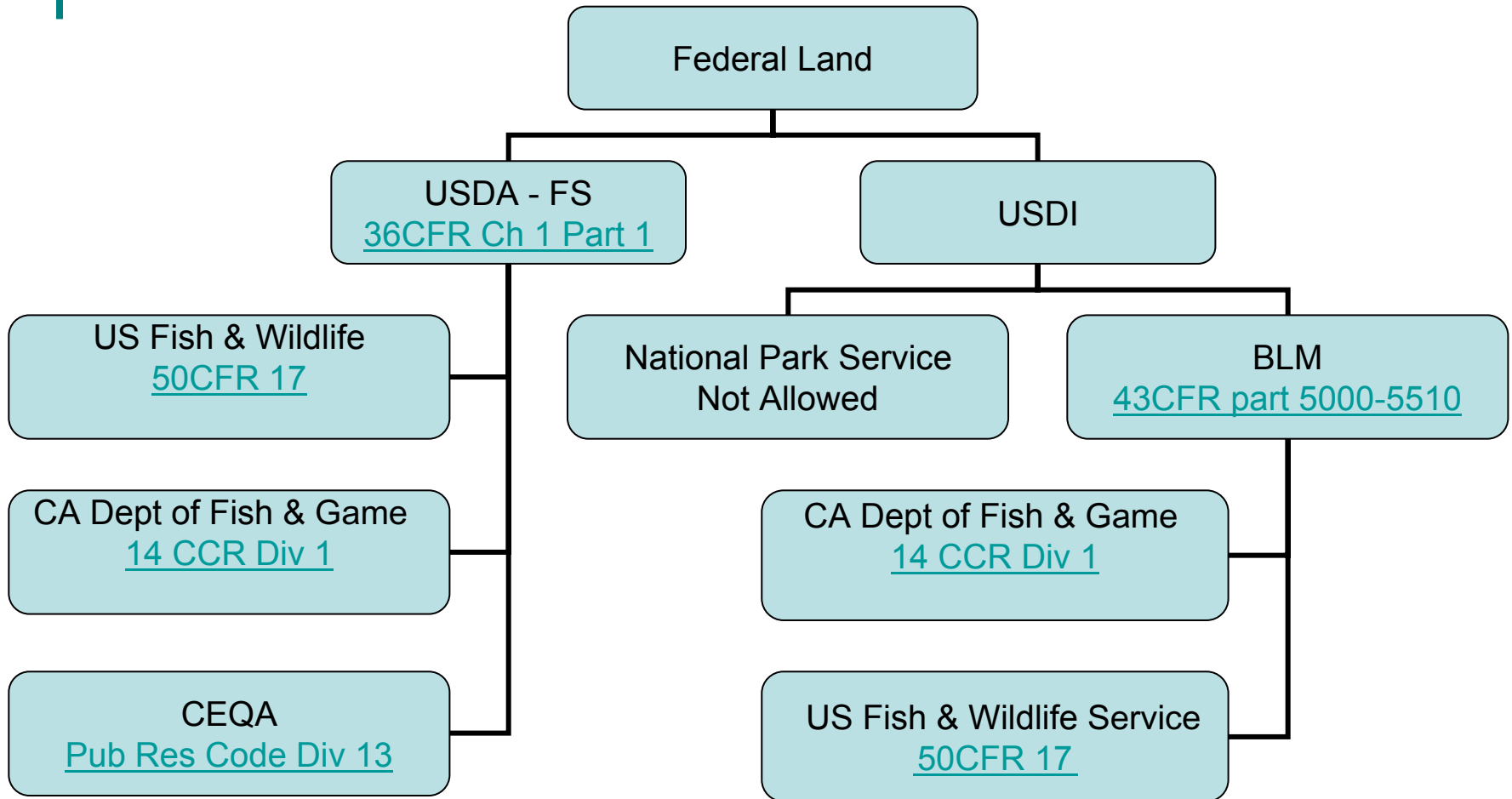


# California Terrestrial Options

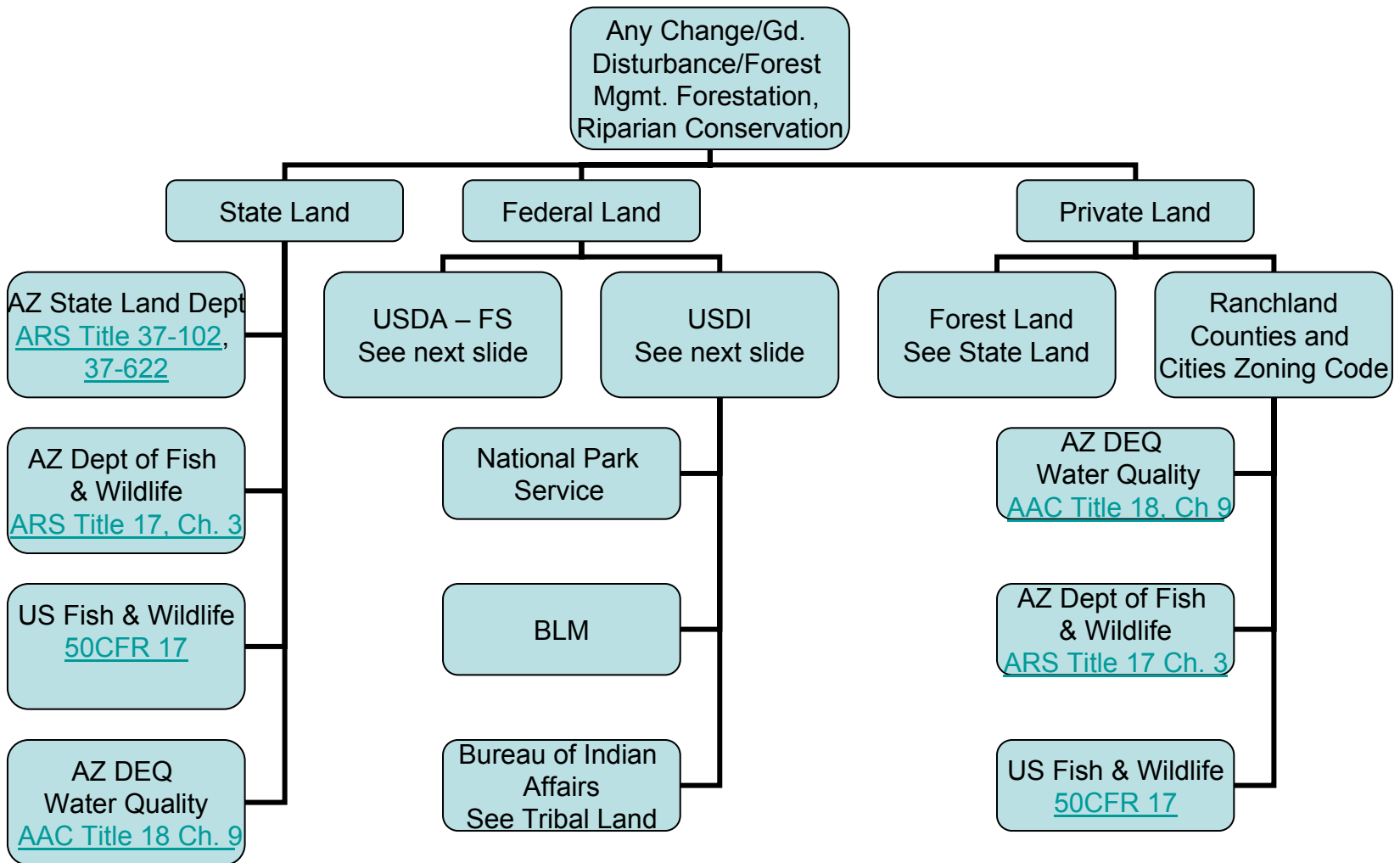
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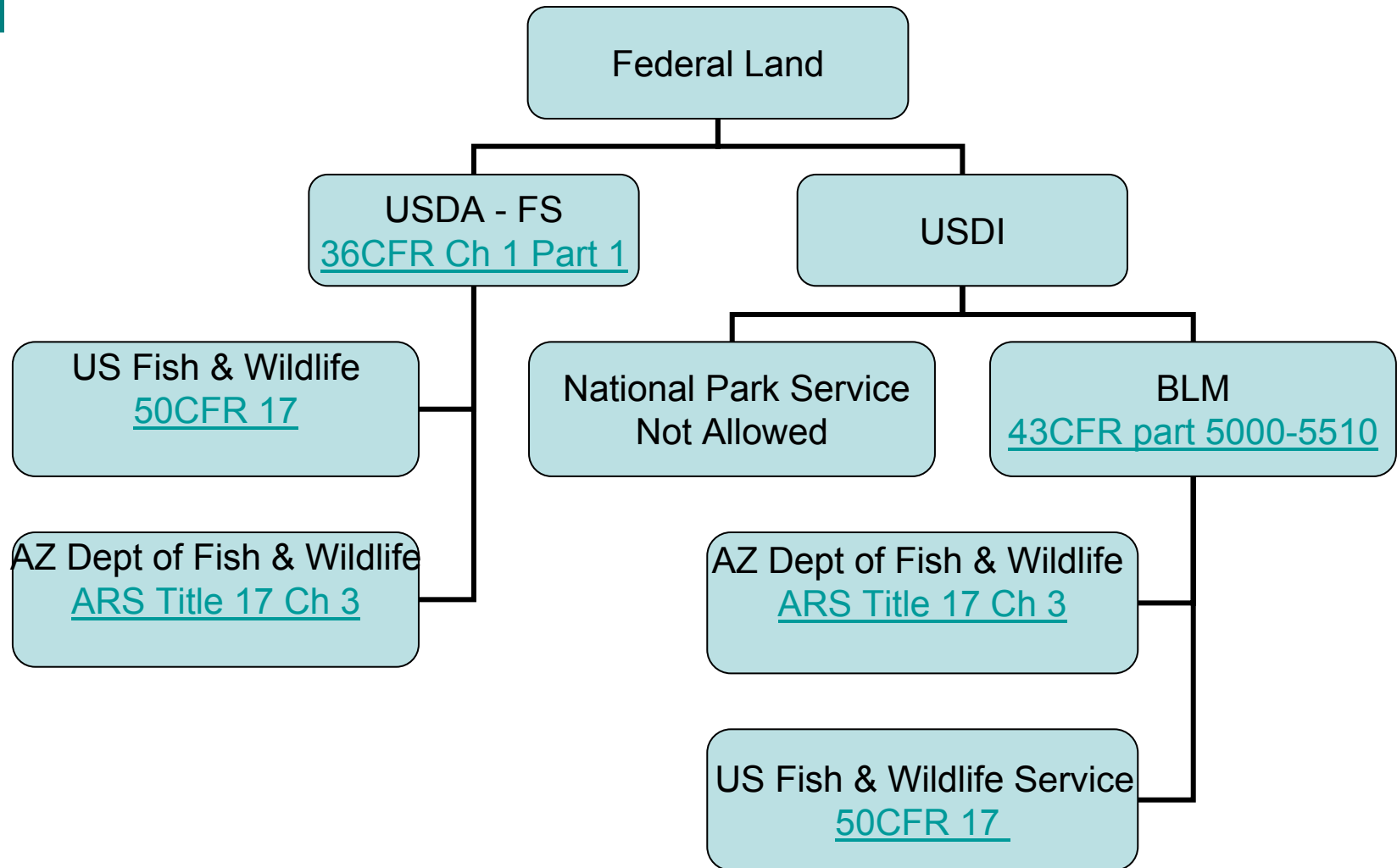
# California Federal Land



# Arizona Terrestrial Options



# Arizona Federal Land



# WA, OR, CA, AZ Biomass

