

US EPA ARCHIVE DOCUMENT

U.S. Fish & Wildlife Service

Our mission is to work with others to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people.





“The face and character of our country are determined by what we do with America and its resources.”

Thomas Jefferson



U.S. Fish & Wildlife Service

Environmental Contaminants Program



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Environmental Contaminants Program



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Environmental Contaminants Program

Commercial & Centralized Oil Field Wastewater Disposal Facilities



Threats to Migratory Birds

Objectives

- **Field inspection observations 1998 – 2008**
- **O & M problems**
 - Oil accumulation on evaporation ponds
 - Surfactants & other chemicals
 - Migratory bird mortality
- **Solutions**



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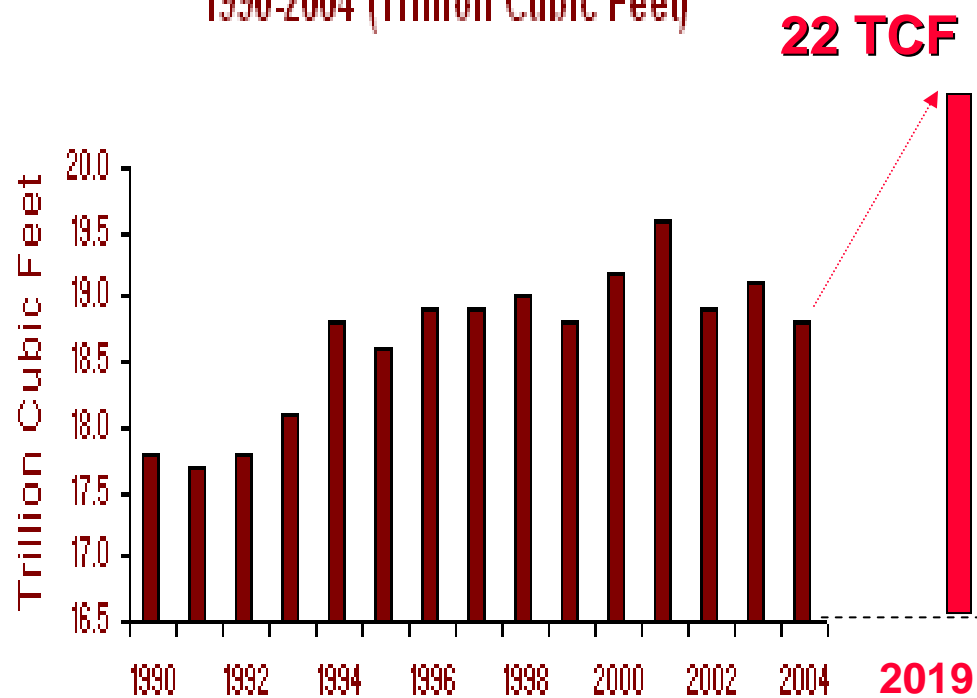
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Background

7



U.S. Dry Natural Gas Production,
1990-2004 (Trillion Cubic Feet)



Source Energy Information Administration,
Monthly Energy Review, DOE/EIA-0035

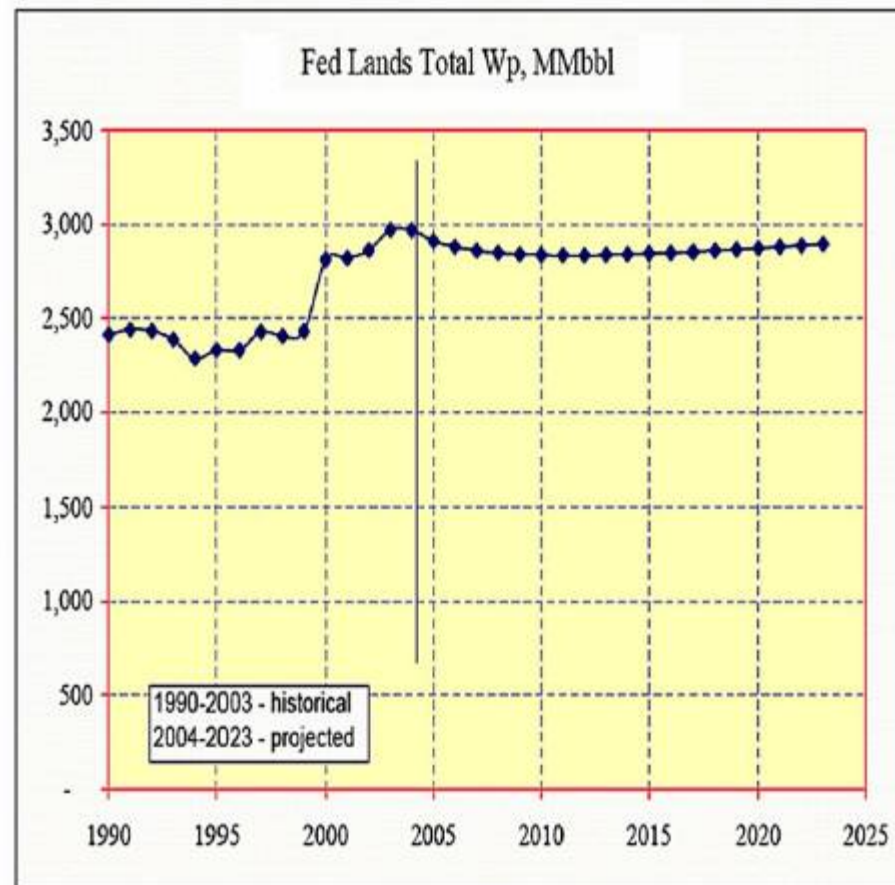
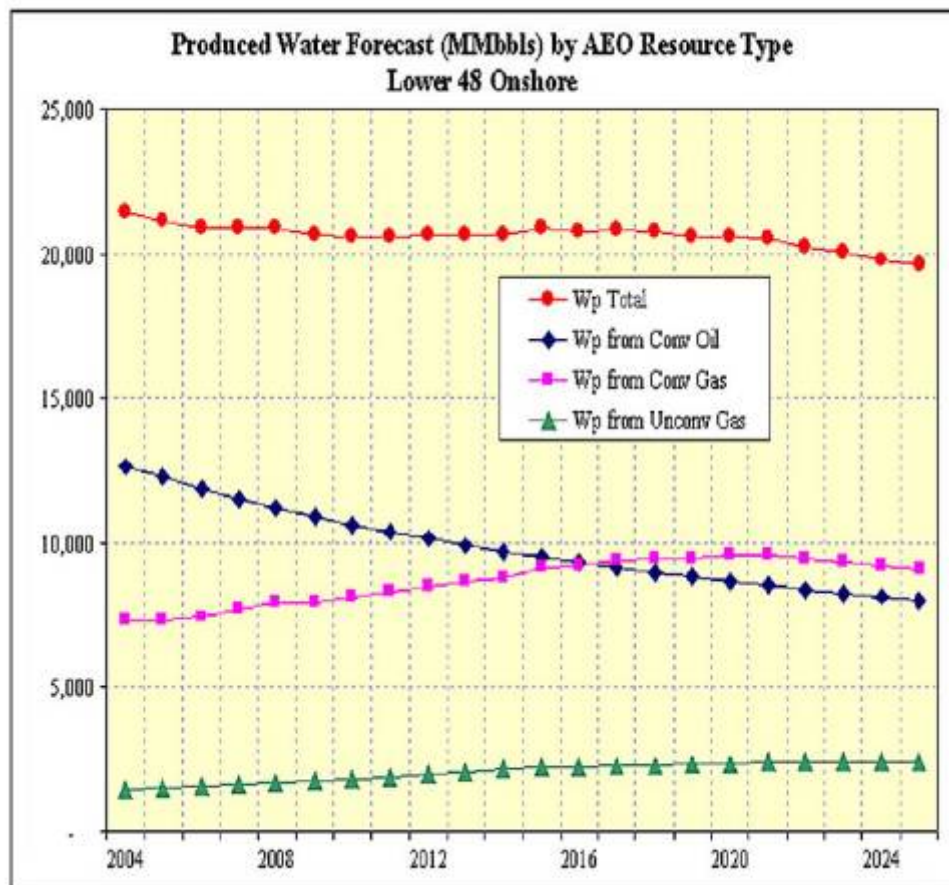


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Background

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20 billion barrels/year



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Background

Produced Water from Natural Gas Production



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Background

Produced Water from Natural Gas Production

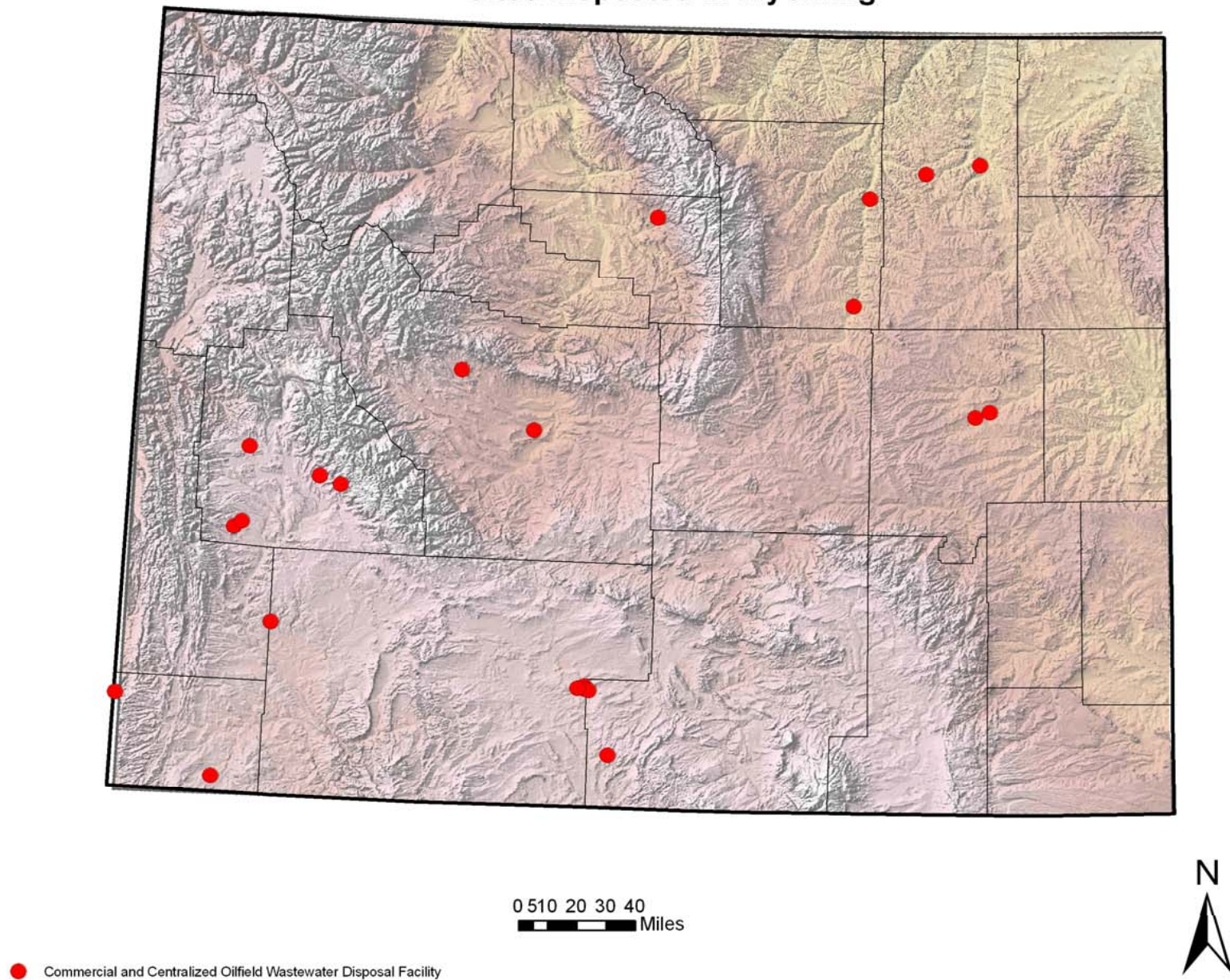
- Higher BTEX
- More toxic
- 10x more toxic than oilfield produced water
- Chemicals
 - Acids
 - Hydrate inhibitors
 - Corrosion inhibitors
 - H₂S Removers
 - Dehydrators



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Sites Inspected in Wyoming



Demand for More COWDFs



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Operation of Facilities



Off loading



Oil-Water Separation



Evaporation



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Operation of Facilities



Off loading



Oil-Water Separation



Evaporation



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Risk to Migratory Birds



- Oil
- Visible Sheens



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Chemicals in Produced Water

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- Solvents
- Crude Oil
- Benzene
- Hydrogen Sulfide
- VOCs
- Surfactants



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Surfactants in Produced Water

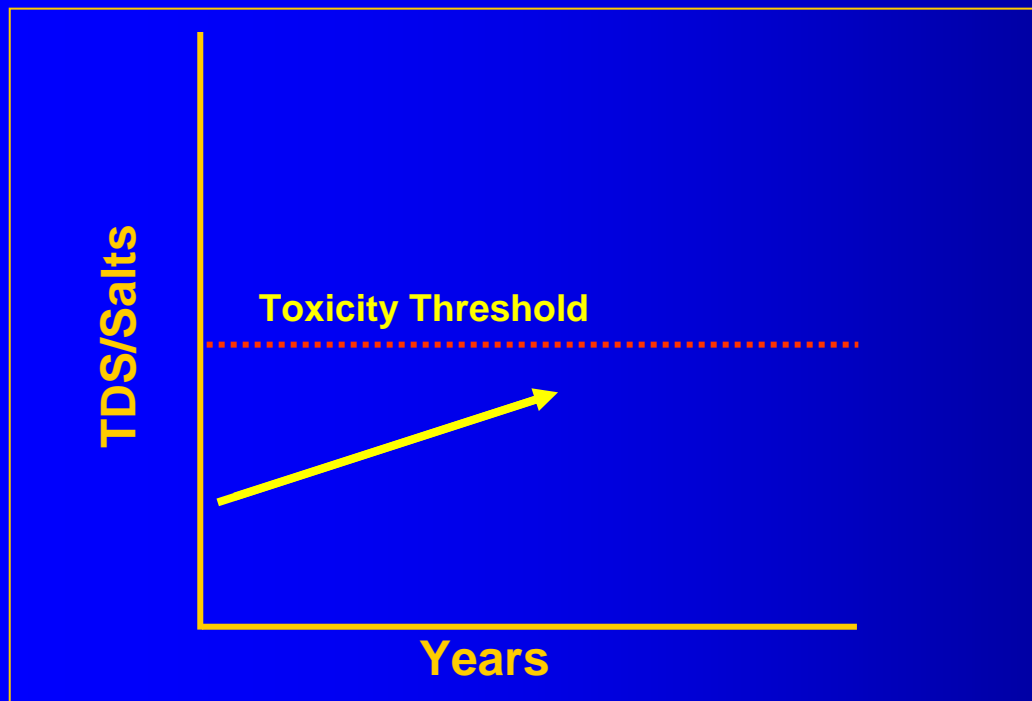
- Reduce Surface Tension in Water
- Water penetrates through feathers
- Birds become waterlogged
- Drowning
- Hypothermia



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Evaporative Concentration Hypersaline Conditions



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Salt Toxicity in Birds



- Na in water > 17,000 ppm
- Salt encrustation on feathers
 - buoyancy loss
 - loss of insulation
- Ingestion of salt crystals
 - 4 grams - toxic

- Elevated Brain sodium
 - > 2,000 ppm in waterfowl
 - > 1,450 ppm in songbirds
- Neurological Impairment
 - inability to hold head upright
 - death due to drowning



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Inspection of Facilities in WY

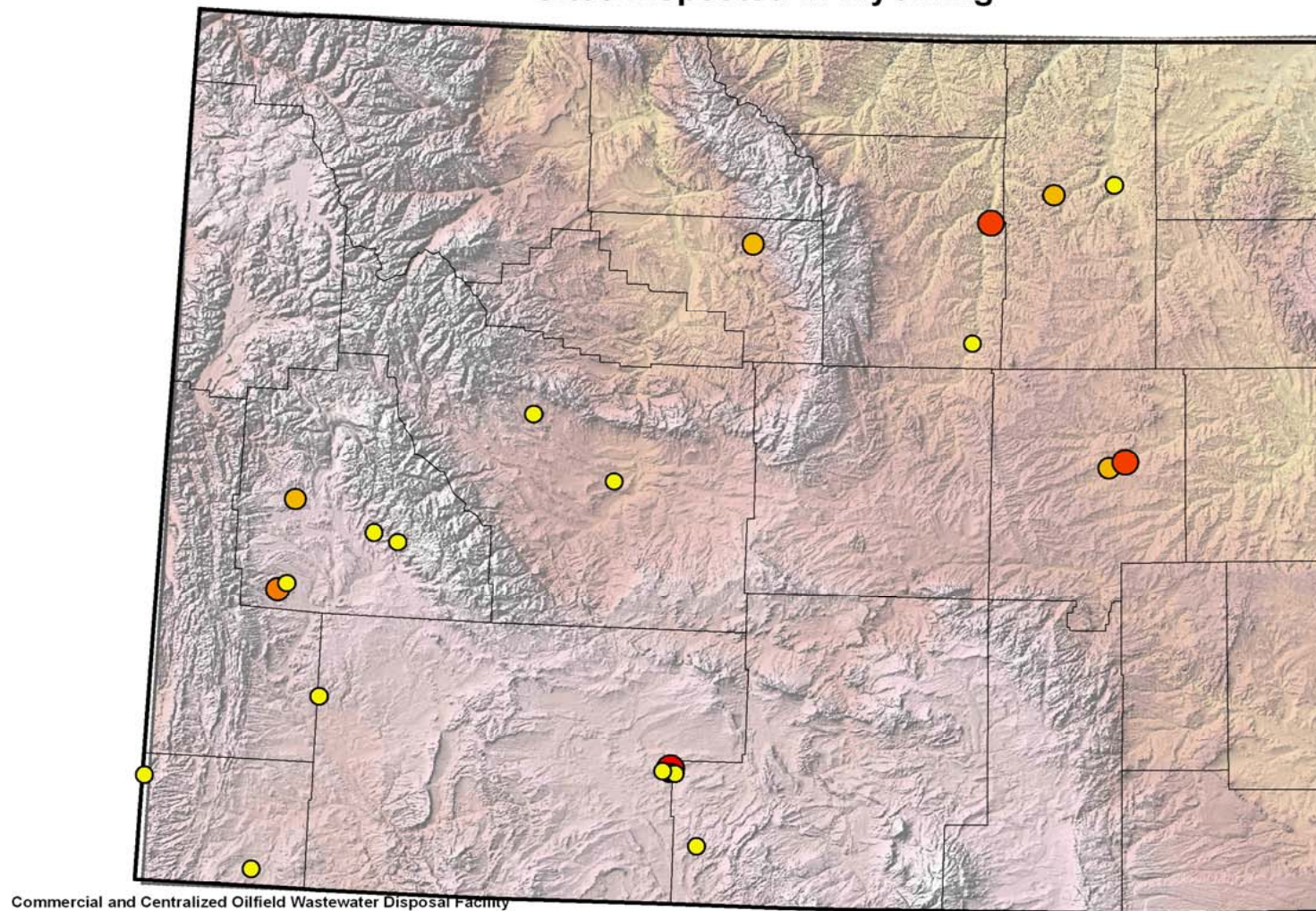
- Mar 1998 – Sep 2008
- Mortality in 13 of 29 facilities
- 235 birds
 - Waterfowl
 - Grebes
 - Songbirds
- Other wildlife
 - Cottontail rabbits
 - Elk calf
 - Tiger salamanders



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Sites Inspected in Wyoming



Field Inspection Results



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Field Inspection Results

COWDF	# Visits	First	Last	Birds	Outcome
McBeth	34	Mar 98	Sep 08	57	RCRA – CA ongoing
Cannon	15	Mar 98	Sep 08	5	Problem continues
Werner	16	Mar 98	Sep 08	33	CA ongoing
Blakes Pit	3	1996	2003	3	Closed
High Plains	13	Nov 01	Sep 08	6	RCRA – CA ongoing
D&B	8	Sep 98	Aug 08	1	RCRA – CA completed
Wamsutter	7	Nov 04	Aug 08	114	RCRA – Bird Avert



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Field Inspection Results

COWDF	# Visits	First	Last	Birds	Outcome
McGinnis	5	Jul 05	Aug 08	12	Bird Balls
Ball Ranch	8	Sep 98	Aug 08	8	Closed
Tierney	2	Jul 02	Aug 02	5	No reported mortality
Riverton	1	Sep 06	Sep 06	1	Bird Avert
Sierra	4	Mar 98	Apr 07	0	WDEQ NOVs
Kinnear Pit	2	Aug 07	Aug 08	0	Net inadequate



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Wamsutter

(Permitted 1997)

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D&B

(Permitted 1984)

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McGinnis

(Permitted 1984)

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Before



After



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Management Problems



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Management Problems

- Off-loading directly into skim pit



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Management Problems

- Off-loading directly into skim pit
- Off-loading directly into evaporation pond



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Management Problems

- Off-loading directly into skim pit
- Off-loading directly into evaporation pond
- Using evaporation pond for oil-water separation



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Management Problems

- Off-loading directly into skim pit
- Off-loading directly into evaporation pond
- Using evaporation pond for oil-water separation
- Oil-saturated banks source of chronic oiling



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Management Problems

- Off-loading directly into skim pit
- Off-loading directly into evaporation pond
- Using evaporation pond for oil-water separation
- Oil-saturated banks source of chronic oiling
- Site Security



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Management Problems

- Off-loading directly into skim pit
- Off-loading directly into evaporation pond
- Using evaporation pond for oil-water separation
- Oil-saturated banks source of chronic oiling
- Site Security
- Poor equipment & maintenance



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Management Problems

- **Wastewater > Facility Capacity**
 - Freeboard < 2 ft.
 - **Overflow**



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Management Problems

- **Wastewater > Facility Capacity**
 - Freeboard < 2 ft.
 - **Overflow**



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Management Problems

- Disposal of Drilling Muds
 - Skim Pits
 - Evaporation Pond



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Management Problems



Constructed in 1980's

- Oil on Evaporation Ponds
- Oil saturated soils
- Off-loading into Evap Ponds
- Poor oil-water separation
- Compliance Issues
 - 12 of 18 facilities



Constructed 1990's

- Synthetic liners
- Designated off-loading
- Better management
- Better water treatment
- Compliance Issues
 - 6 of 11 facilities



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So What?

- Total # Bird Carcasses Recovered = 223
- Total Actual Mortality = Unknown
- 500,000 to 1 million birds lost annually in oil pits*



*Trail, P. 2006. Avian mortality at oil pits in the United States: a review of the problem and efforts for its solution. Environmental Management. 38:532-544



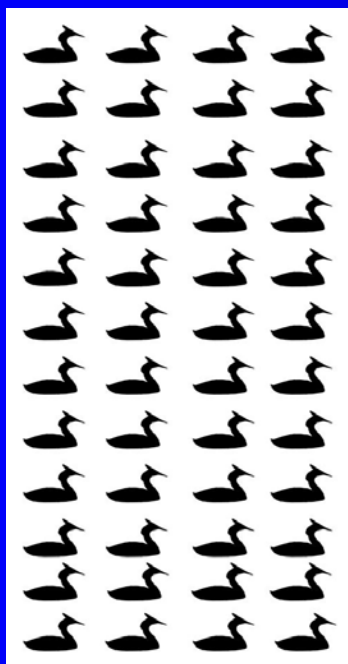
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So What?

- Total # Eared Grebe Mortality = 50
- Avg # per Inspection = 2
- # Inspections Needed per YR = 24
- Estimated Mortality per Year = 48

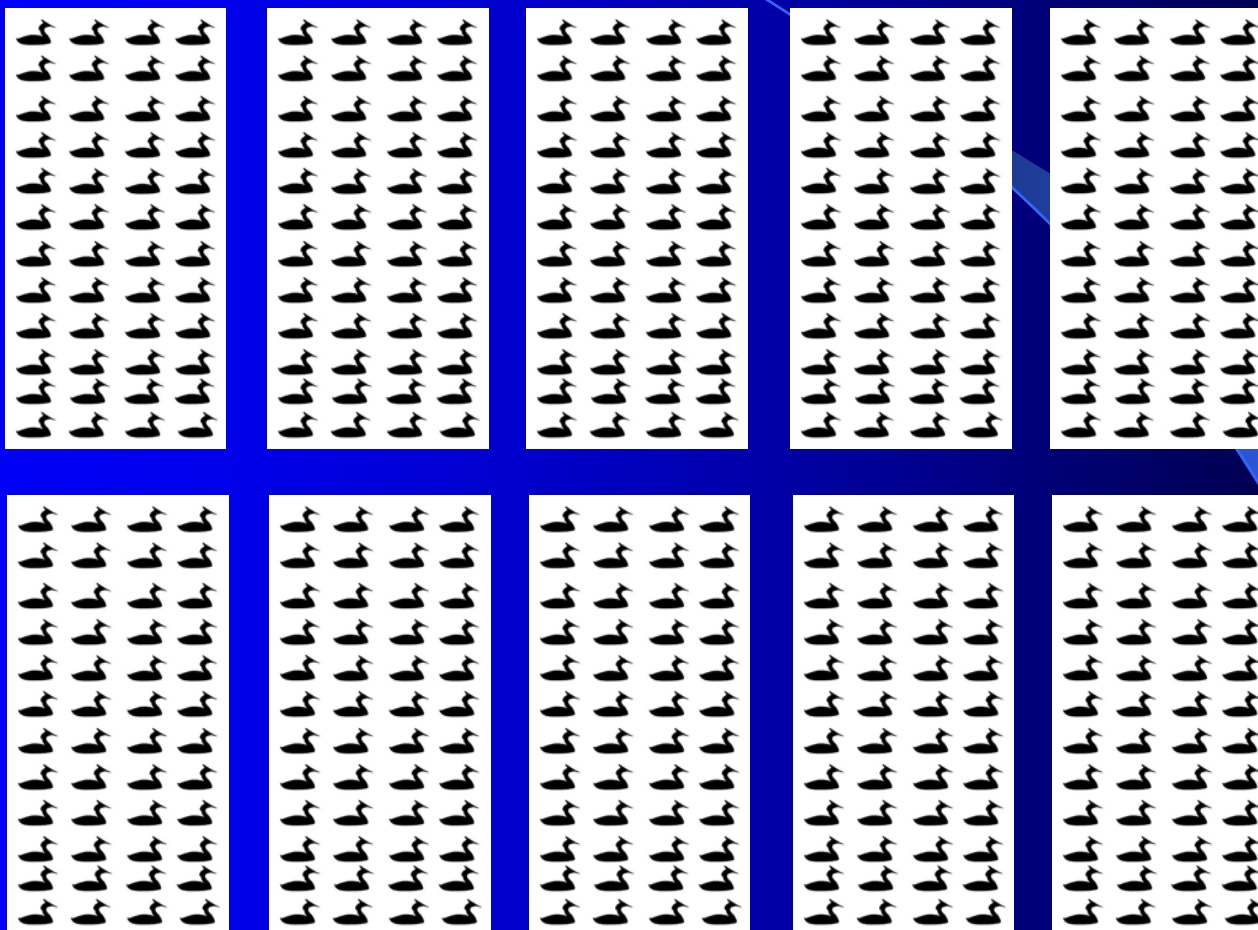


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So What?

- 1998 to 2007

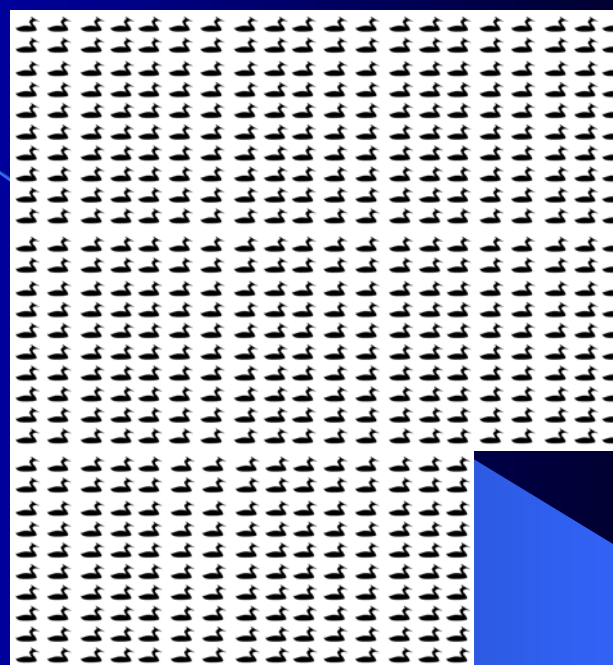
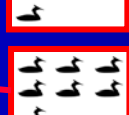
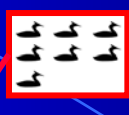
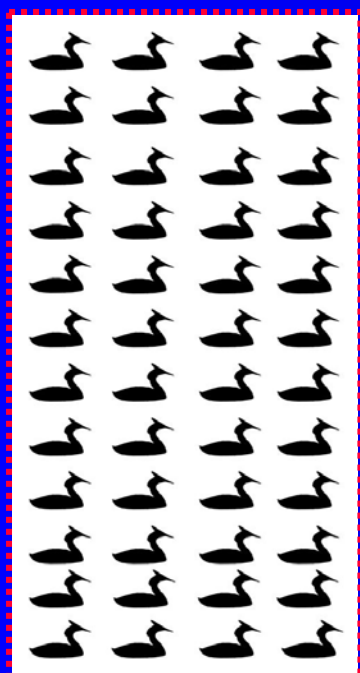


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So What?

- 1998 to 2007



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Management Recommendations

- **Site Security**
 - Closed & Locked Gates
 - Controlled Access

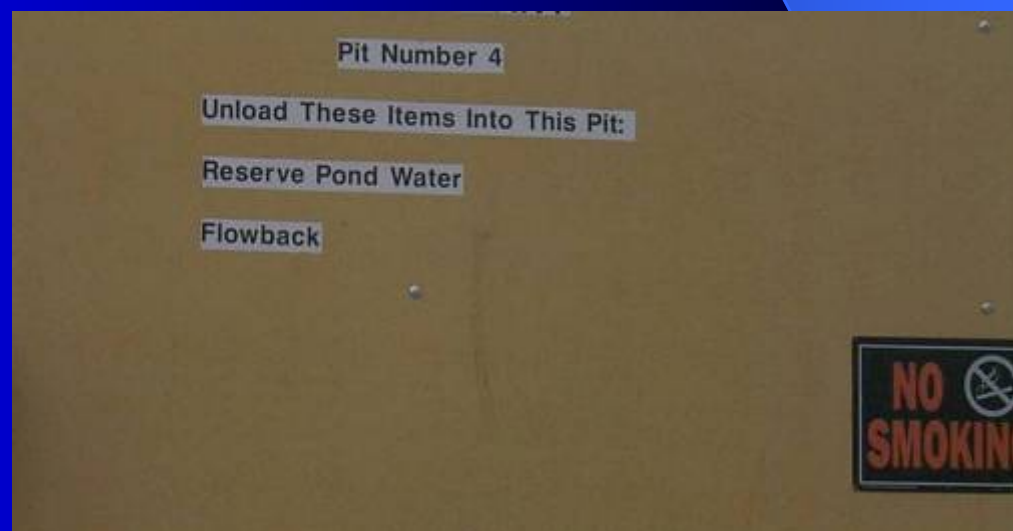
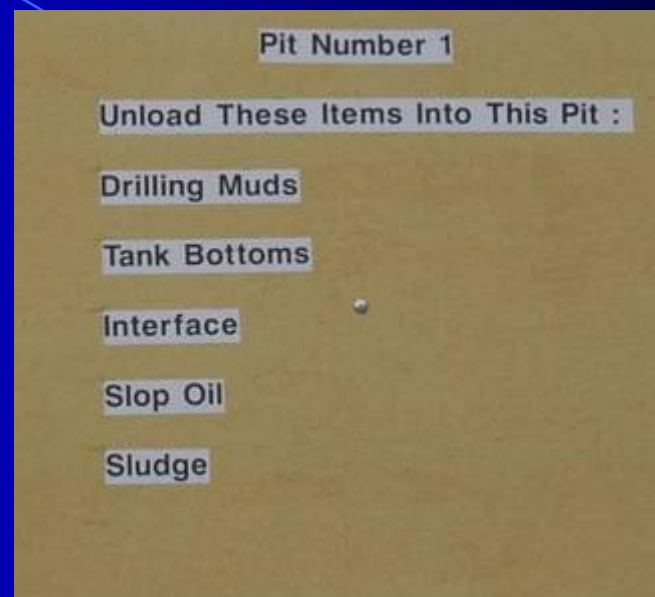


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Management Recommendations

- Signs



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Management Recommendations

- Exclude Wildlife



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Management Recommendations

- Designated Off-loading area
- Controlled Access
 - Evaporation Ponds



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Management Recommendations

- **Spill contingency plans**
 - Facility
 - Evaporation Ponds



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8/26/2004 8:17am

Management Recommendations

- **Separate Disposal Sites**
 - Drilling muds
 - Frac'ing Fluids (surfactants)



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Management Recommendations

- **Training for Facility Personnel**
 - Permit Requirements
 - Allowed Waste
 - Waste management
 - Corrective Action
- **Annual Refresher**



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Future Outlook

- Hypersaline Evaporation Ponds
- Migratory bird losses



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Future Outlook

- **Transfer of Ownership**
 - Untrained facility personnel
- **Facility Mismanagement**



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Future Outlook

- New E & P chemicals



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Future Outlook

- Well managed facilities
- Protection of Environment
- No migratory bird losses
- Reduced liabilities for operator



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<http://www.fws.gov/mountain-prairie/contaminants/contaminants1b.html>

Commercial Oil Field Wastewater Disposal Facilities, Region 6 Environmental Contaminants, U.S. Fish and Wildlife Service - Mozilla Firefox


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Region 6 Environmental Contaminants

Contaminant Issues - Oil Field Waste Pits

Return to [Oil Field Waste Pits](#)

Commercial Oil Field Waste Disposal Facilities


Commercial oil field waste disposal facilities (COWDFs), like oil field waste pits, pose a significant risk to migratory birds and other wildlife because they use large evaporation ponds (either passive or with aeration) to dispose of and treat oil and gas exploration and production wastes. COWDFs that dispose of wastewater through deep well injection generally do not pose a risk to wildlife.



There are 36 COWDFs in Region 6. All are in Colorado, Utah and Wyoming. COWDFs are hazardous to wildlife as they accumulate significant quantities of oil on the surface of very large pits or evaporation ponds without effective wildlife exclusionary devices. Generally, COWDFs are operated in the following manner. Wastewater is initially disposed of into a receiving pit and the greatest amount of oil tends to float to the surface in that pit. Water from receiving pits is often sent to another pit or series of pits for evaporation or other management.

The following management practices make COWDFs a risk to the environment and migratory birds:

- no site security such as fencing and locking gates to prevent unauthorized entry and the unauthorized disposal of wastes at the facility other than oil field produced water




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