

Governor Frank Keating's **Tar Creek Superfund** **Task Force**

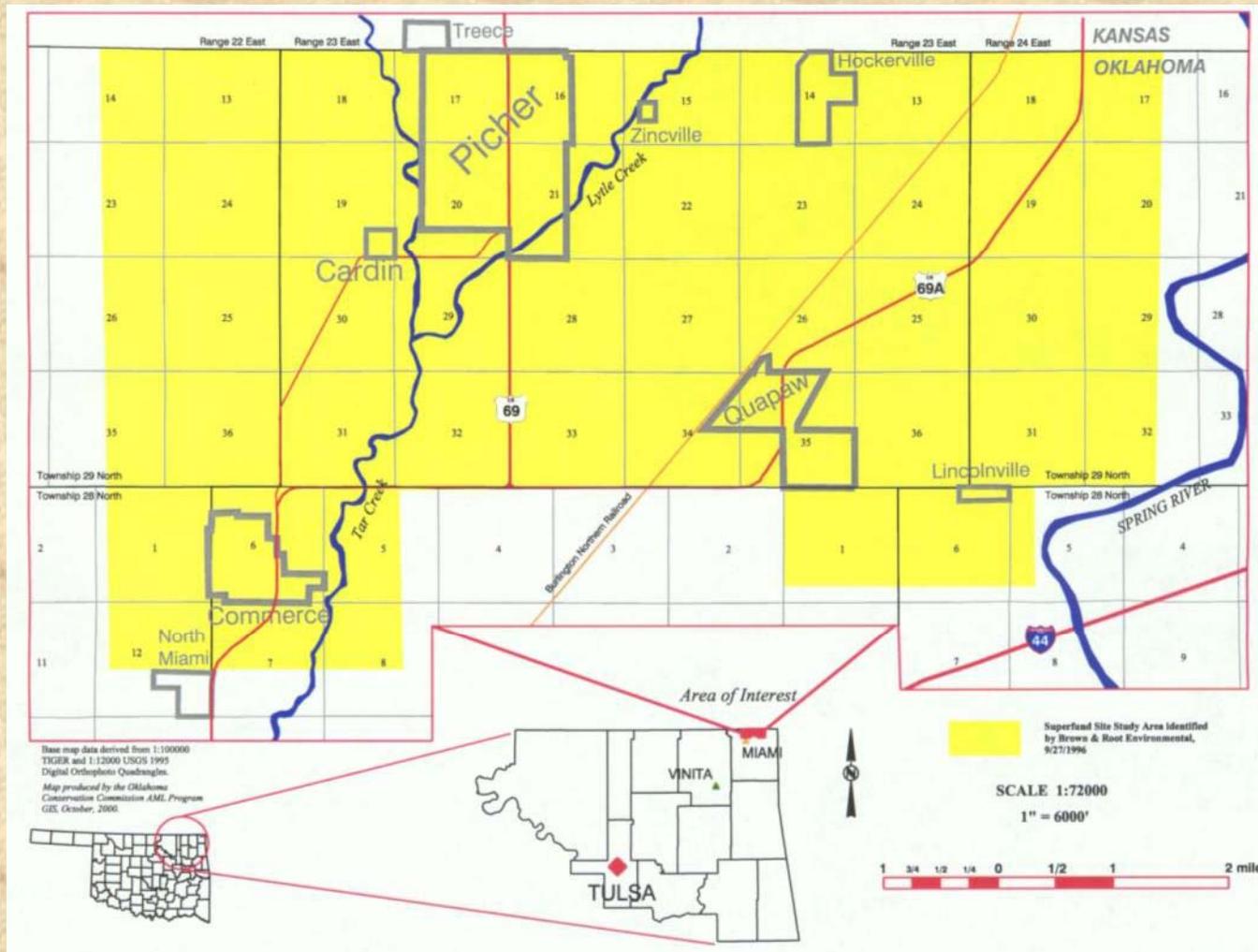
Final Report

1 October 2000



State of Oklahoma
Office of the Secretary of Environment

Tar Creek Superfund Site Location





Tri-State Mining History

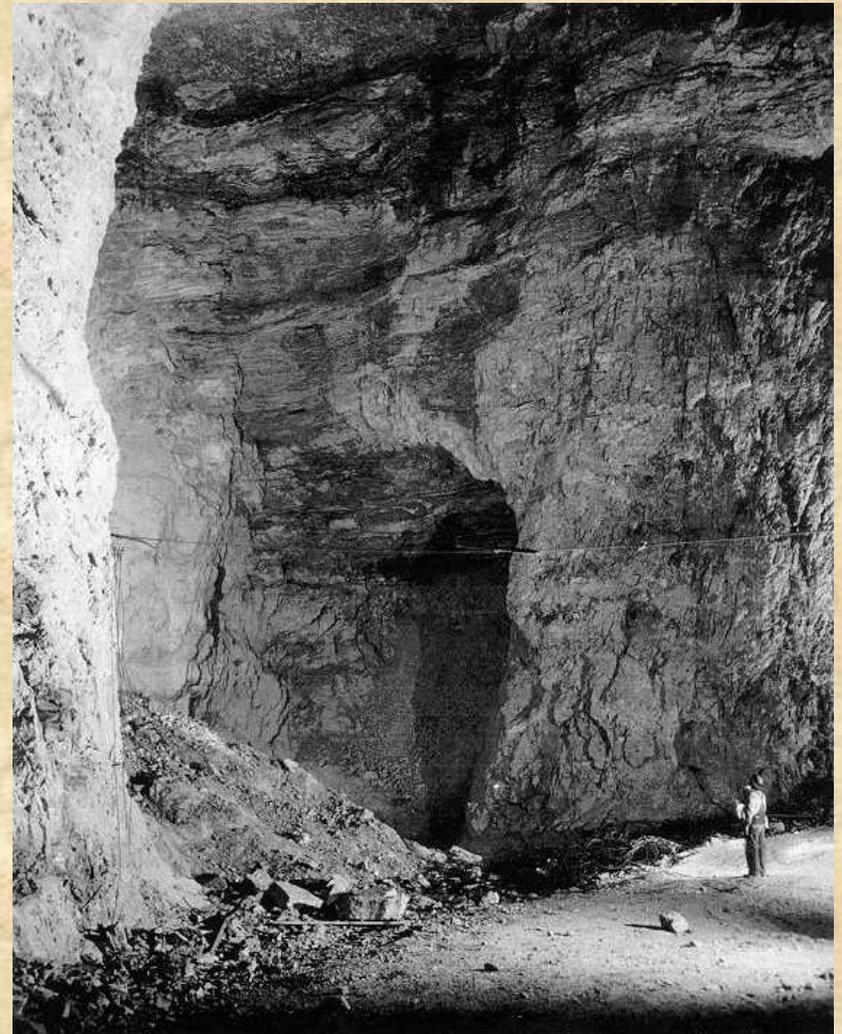


- " Lead & zinc mining began near Peoria, OK in 1891
- " Tri-State District was once the leading U.S. producer, supplying 26% of nation's lead & zinc products
- " From 1907 to 1946, more than 1.9 MM tons of Pb & Zn were mined in the area at a value of more than \$202 MM



Tri-State Mining History

- " Mining companies began closing doors in 1958, although Eagle-Picher was last to leave in 1970
- " Mines produced
 - o 1.7 MM tons of Pb
 - o 8.8 MM tons of Zn
- " Left behind
 - o 300 mi of tunnels
 - o 165 MM tons of tailings
 - o acid mine drainage



Tar Creek Superfund Site History



- “ Tar Creek site added to NPL in 1983
- “ Highest-ranking site on NPL
- “ Originally considered for ground and surface water contamination (“OU-1”)
- “ Project expanded in 1990s to include elevated blood lead levels (“OU-2”)
- “ Project area encompasses 40 square miles
- “ Includes communities of Picher, Cardin, Quapaw, Commerce, and North Miami



Operable Unit One (“OU-1”)

- “ Began in early 1980s to address water quality concerns
- “ Diversion of surface water from mine shafts (halt acid mine drainage)
- “ Plugging of bore holes and improperly sealed wells (prevent contamination of Roubidoux aquifer)
- “ Efforts were unsuccessful in halting acid mine drainage



Operable Unit Two (“OU-2”)



- “ 1993 study by Indian Health Service indicated that 34% of Native American children had elevated blood lead levels
- “ EPA began residential surface waste cleanup to remove lead contaminated soils, driveways, etc.
- “ Initial phase = 1537 homes
- “ Second phase = 500-600 more homes (*proposed*)



New/Unaddressed Concerns

- " health effects of heavy metal exposure
- " approximately 1320 open or poorly sealed mine shafts
- " extensive subsidence problems
- " 75 MM tons of mine tailings ("chat") remaining
- " chronic flooding and poor community drainage
- " continued acid mine drainage & water quality impairments
- " Native American concerns
- " NRDA & cost recovery



Tar Creek Superfund Task Force



- " Executive Order 2000-02 signed January 2000
 - " Formed Task Force to address mounting concerns for the health & safety of the citizens of Ottawa County
 - " Action plan for completely addressing all new/unaddressed concerns due to Governor by 1 October 2000
- " Executive Order Assignments:
 - o examine, identify, & establish priorities regarding health and environmental threats
 - o recommend most feasible solutions to those threats
 - o identify all potential resources for remediation
 - o recommend any necessary legal, legislative, or administrative actions to tap resources
 - o analyze effectiveness of past & current efforts
 - o develop structural & operational changes necessary to implement protections
 - o recommend ways to improve coordination & communication



Task Force Membership

Brian C. Griffin, *Chairman*
Secretary of Environment

Karl Ahlgren
Office of Congressman Tom Coburn

Neal McCaleb
Secretary of Transportation

Mark Coleman
OK Dept. of Environmental Quality

Rep. Larry Roberts
Oklahoma House of Representatives

Virgil Jurgensmeyer
J&M Farms, Miami

Dick Seybolt
Grand Lake Area Businessman

Sen. Rick Littlefield
Oklahoma State Senate

Mike Smith
Secretary of Energy

Tamara Summerfield
Chair, Quapaw Tribe of Oklahoma



Eight Subcommittees



Health Effects

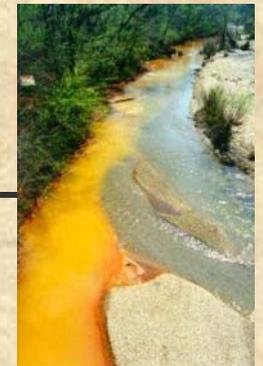


Drainage/
Flooding



Subsidence

Water Quality



Mine Shafts



Native American
Issues

Chat Use



NRDA



Health Effects Subcommittee



- " Past studies show approximately 34% of children in area have elevated blood lead levels
- " Prevalence has dropped, but levels remain well above state and national averages
- " Soil removal efforts have had significant impact on reducing prevalence of elevated blood lead levels (as have LBP removal and educational efforts)



Health Effects Recommendations



- ” Intensify efforts to track & reduce blood lead levels (“BLL”)**
 - regular screening of Ottawa Co. children
 - tracking of exposed children over time
 - GIS map of BLL & environmental exposures
 - coordinated educational efforts
 - develop community relevant strategies
 - continue BLL monitoring & develop database to facilitate tracking, sharing, and assessment of community impact

Health Effects Recommendations



- " **Initiate long-term study on health outcomes in children (e.g., occurrence of learning disabilities)**

- " **Study effects of lead/metals exposure on adult and adolescent health**
 - Neurological Effects
 - Kidney Disease & Hypertension
 - Hearing Loss
 - Cancers
 - Alzheimer's & Parkinson's Diseases

Health Effects Recommendations



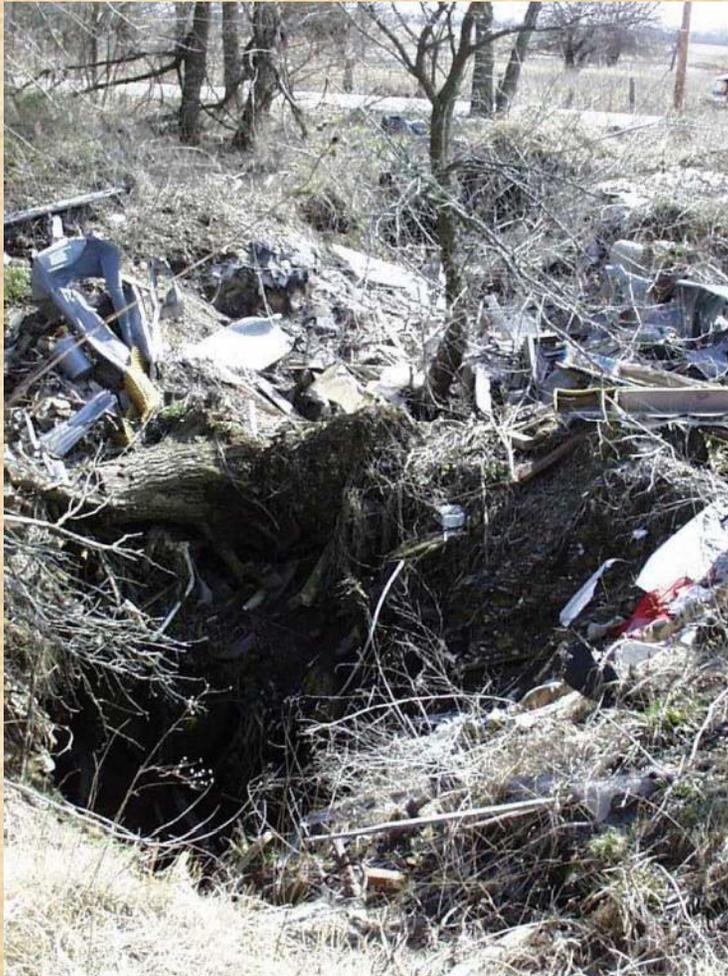
- " Continue efforts to remediate yards with elevated levels of lead**
- " Study the health effects from gathering & consuming wild foods**
- " Continue & expand current LBP remediation efforts**
- " Public health must be first and foremost consideration in any efforts to remove chat from area**



Health Effects Costs

Phase II of yard remediation	\$27,500,000
BLL screening, tracking, and mapping	\$25,000 + \$400,000/yr
Long-term learning disability study	\$500,000
Adult/adolescent health	\$4,000,000
Consuming wild foods	\$450,000
Accelerated LBP removal	\$2,000,000
TOTAL	\$34,475,000 (+ \$400,000/yr)

Subsidence Subcommittee



- “ As of 1986, 59 “major” collapses were identified that disturbed approx. 47 surface acres
- “ At least 8 more collapses since (including State Line Road)
- “ Continued subsidence is likely . . . threatening the health, safety, and environment in the area

Subsidence Recommendations

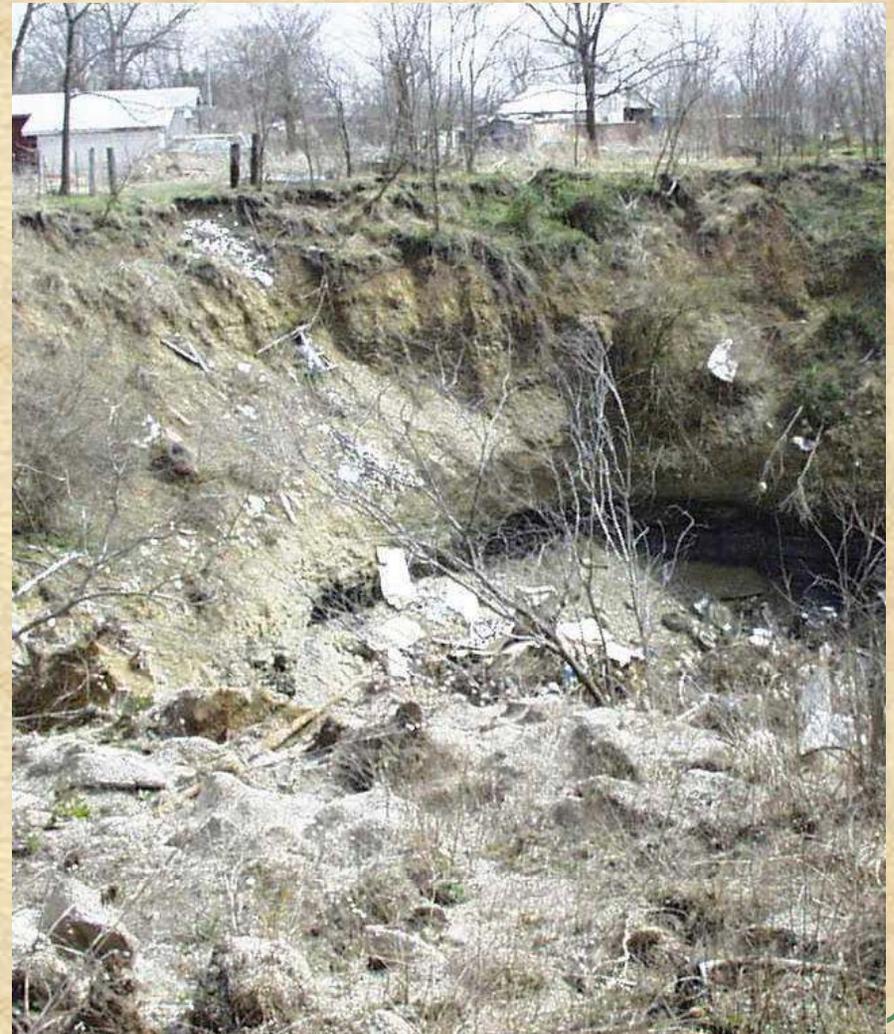


- " Develop & maintain GIS to integrate all data associated with potential & existing subsidence areas; use to identify high-risk areas**
- " Consider use of infrared technology to update existing subsidence information**
- " Use Subcommittee's matrices to prioritize areas for subsidence abatement**

Subsidence Recommendations



- “ Immediate investigation & remediation of State Line Road subsidence
- “ Further identification & exploitation of all avenues to fund subsidence abatement
- “ Fill selected mine shafts to reduce potential for new subsidence
- “ Consider using readily-available chat as backfill material



Subsidence Abatement Alternatives



Subsidence Prevention

- " Complete fill with concrete grout " \$7.98 MM per acre
- " Targeted grouting " \$1.69 MM per acre
- " Targeted backfilling with chat " \$1.35 MM per acre
- " Residence relocation (zoning) " \$100 K per residence

Filling Average* Subsided Area

- " Fill with riprap " \$285,246 / collapse
- " Fill with chat " \$112,349 / collapse
- " Berm & fence " \$ 10,000 / collapse

* 50'W x 70'L x 140'D



Subsidence Costs

<i>No.</i>	<i>Method of Abatement</i>	<i>Cost</i>
2,000	Relocation (subsidence prevention)	\$200,000,000
67*	Fill with rip rap	\$19,111,000
TOTAL		\$219,111,000

* *Number of major subsidence areas identified by Subcommittee.*



Mine Shaft Subcommittee

- “ Estimated 1,320 mine shafts in the area, plus thousands more drill holes & other openings
- “ Possibly more than 300 shafts in Picher-Cardin area alone & over 2,600 shafts in entire Tri-State Mining District!
- “ In addition to safety risks, open shafts erode into larger subsidence problems and exacerbate mine drainage discharges



Mine Shaft Recommendations



- " Develop GIS of known shafts & bore holes, along with their attributes, and solicit public input on locations of other openings**
- " Use Subcommittee's matrix to prioritize closure projects**
- " Identify lands under BIA jurisdiction to enable closure by those authorities**

Mine Shaft Recommendations



- " Identify underground features of openings targeted for closure to select most appropriate closure method
- " Plug open drill holes with concrete to depth of 10 ft
- " Continue negotiations with EPA to approve closure program under CERCLA



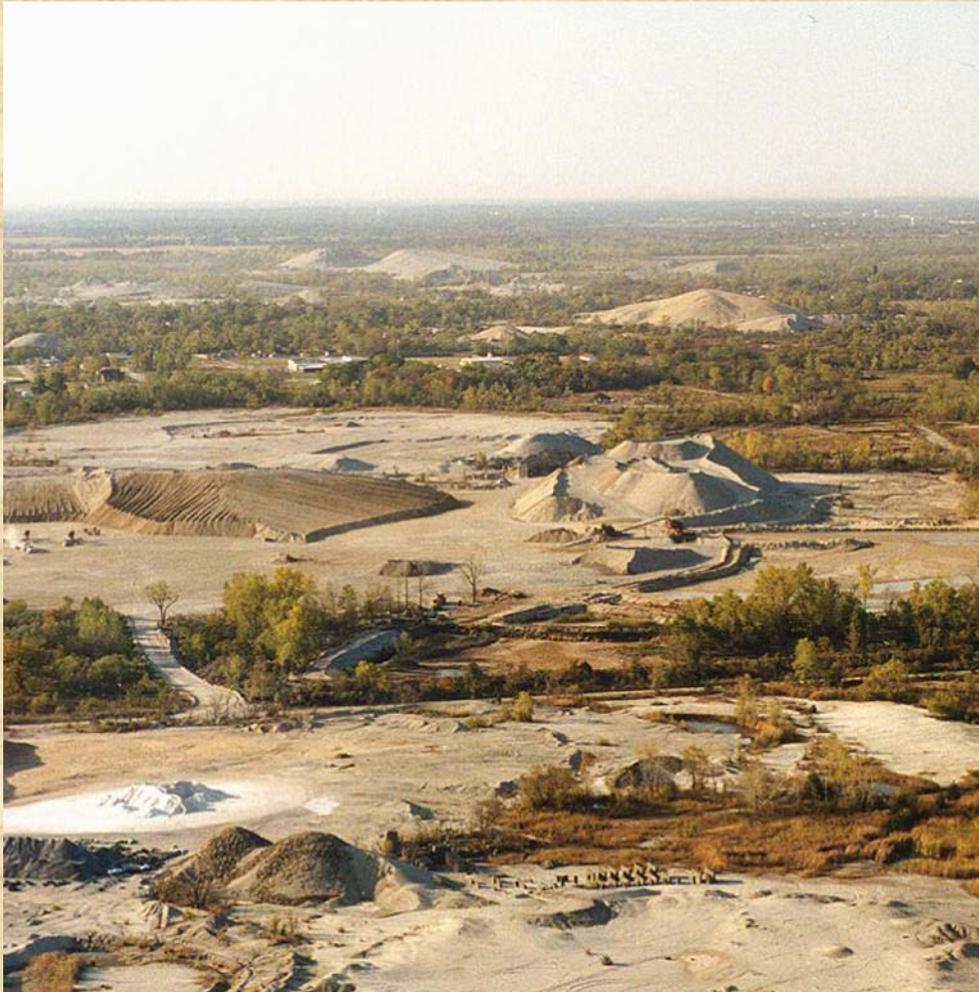


Mine Shaft Costs

Identification/Mapping	11 mo.	\$250,000
Closure	5 yr.	\$10,000,000
TOTAL	6 yr.	\$10,250,000



Chat Use Subcommittee



- " 75 MM tons of chat in Superfund area
- " Regulatory guidelines are conflicting
- " BIA Moratorium on sale of Native American-owned chat
- " No way to effectively move large volumes of chat
- " No central point of contact to market the chat
- " Piles are an "attractive nuisance" for area youth



Chat Use Recommendations



- “ Recognize that health and environmental problems caused by chat piles can’t be fully mitigated until chat is removed and used in a safe, economical, and effective manner

- “ Establish safe, economical, and effective chat use guidelines
- “ Establish reasonable cost testing processes available to all
- “ Remove discriminatory BIA moratorium on Native American-owned chat sales





Chat Use Recommendations

- “ Establish a local Industrial Trust Authority to coordinate transportation & marketing of chat
- “ Include the following projects in the Remedial Investigation/Feasibility Study (“RI/FS”):
 - Development of new hot mix asphalt designs optimizing use of chat
 - Development of a chat marketing program
 - Implement pilot projects in Ottawa County and a locale that lacks suitable local aggregates



Chat Use Costs

Recommendation	Cost
Establish Industrial Trust	\$125,000
Hot Mix Asphalt Designs	\$500,000
Marketing Plan, Facilities Plan, Operations Budget	\$589,000
Pilot Projects	\$600,000
TOTAL	\$1,814,000

Drainage/Flooding Subcommittee



- “ Drainage area greatly disturbed by more than 80 years of mining activity
- “ Result is poorly draining streams that are commonly bankfull of water, even during non-flood periods
- “ Without modification, system will continue to experience frequent flooding



Drainage/Flooding Problems



- “ Stream aggradation due to mining activities
- “ Inadequate drainage systems in the communities
- “ Manmade obstructions to flow
- “ Neosho River/Tar Creek flooding problems in Miami

Drainage/Flooding Solutions



- “ Channel improvements and/or buyouts of repetitive loss structures
- “ Ecosystem restoration, including constructed wetlands and riparian establishment
- “ Conduct feasibility study to fine tune “concept plan” for addressing drainage & flooding concerns





Drainage/Flooding Costs

Immediate Actions (1 year)

Stream maintenance	\$140,000
Community Master Drainage Planning	\$360,000
Flooding Feasibility Study	\$3,000,000
Preparation of FHMP	\$25,000
SUBtotal	\$3,525,000



Drainage/Flooding Costs

Short Term Actions (2-3 years)

Community Drainage Improvements	\$5,740,000
Grand Lake Backwater Feasibility Study	\$1,700,000

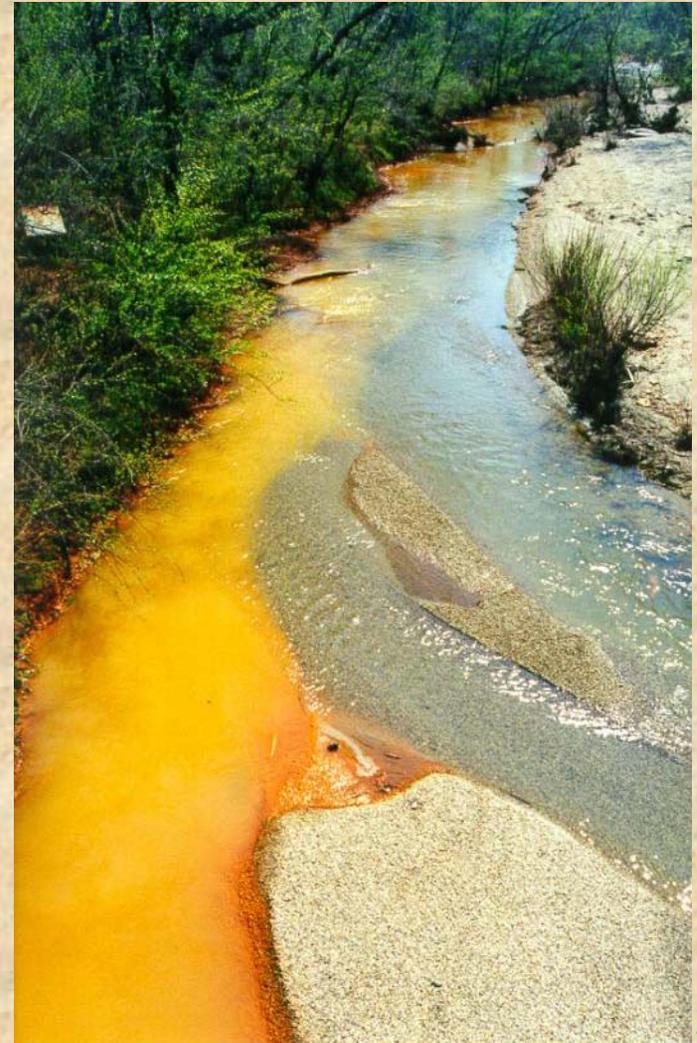
Long Term Actions (3-5 years)

Tar/Lytle Creek Flooding Control Construction	\$22,000,000
Acquisition of Repetitive Loss Structures	\$15,500,000
TOTAL	\$48,465,000

Water Quality Subcommittee



- " Tar Creek's water quality does not meet beneficial uses
- " Contaminant concentrations in acid mine seepage and acidity of Tar Creek remain
- " Shallow Boone Aquifer is contaminated with acidic & metals-laden water
- " Impaired Boone threatens drinking water source -- Roubidoux Aquifer



Water Quality Recommendations



- " Comprehensive monitoring of mine drainage discharges and chat pile/mill pond runoff to develop most feasible treatment systems
- " Strengthen & coordinate monitoring efforts to characterize current water quality and monitoring trends
- " Collect & analyze fish flesh to determine level of contamination (if any)

Water Quality Recommendations



- “ Implement pilot-scale demonstrations on passive treatment wetland systems
- “ Once appropriate systems are identified, implement full-scale wetland systems





Water Quality Study Costs

WQ monitoring of Tar Creek Basin	\$ 80,000
Boone Aquifer study	\$ 111,190
Sediment study	\$ 20,000
Mine discharge monitoring	\$ 1,000,000
Chat pile/mill pond runoff monitoring	\$1,000,000



Water Quality Costs

Studies (from previous)	\$ 2,211,190
Wetlands pilot projects	\$ 5,000,000
Wetland remedies coordination	\$ 100,000
Full-scale implementation of wetland systems	\$ 18,000,000
TOTAL	\$ 25,311,190

Native American Subcommittee



“ Estimated 70% of Superfund area and 80% of stockpiled chat is on Quapaw land





Native American Issues

" BIA Moratorium/Chat Use Policy

- Discriminatory prohibition against chat sales by one Federal agency (BIA) when another (EPA) allows widespread sale and use of chat
- Subcommittee appreciates efforts to establish chat use guidelines and requests State, EPA, & BIA assistance in expeditiously lifting the BIA moratorium

" Tribal Sovereignty/Jurisdiction

- More coordinated State/Tribe effort in working with Federal government programs to remediate site

" Air Quality

- More comprehensive air transport studies, including silica dust, radioactive elements, and natural asbestos



Native American Issues

- " **Native American Employment at Site**
 - Subcommittee requests Native American hiring preference for work at site, as well as training programs to help them qualify for jobs, since 70% of Superfund site is on tribal lands
- " **Downstream Impacts**
 - Need studies to assess damages to cultural resources in, and downstream of, Superfund site
- " **Indian Health Service/Tribal CHR Funding**
 - IHS funds are being cut; blood sampling equip. needed
- " **Culturally Significant Foods**
 - Research needed to assess impacts to cultural plant, aquatic, and animal food resources



NRDA Subcommittee

- " Natural resources potentially affected by contaminants at the Site include threatened & endangered species, migratory birds, surface water, ground water, drinking water, plants, fish, biota, wildlife, and cultural, agricultural, terrestrial resources
- " Indications are that there have been extensive injuries to natural resources at the Site
- " Damages could exceed several hundred million dollars





NRDA Process

- “ Continue Tri-State Partnership (3 states, 8 tribes, & federal government) to share resources and information
- “ Finish preassessment to determine reasonable probability of NRD claim success (Spring 2001)
- “ Initiate Assessment Plan phase if preassessment shows probability of success (late 2001)
- “ After Assessment, Trustees present PRPs with written demand for damages & assessment costs; litigation pursued if demands not met



NRDA Recommendations

- " **Contract with professional consultant to analyze PRP information and add to GIS**
 - PRP information is beneficial to both NRDA and Cost Recovery Action for remediation expenses
 - Costs should be shared between State, DOI, and EPA
 - Should form Legal Committee to facilitate better sharing of PRP information

- " **Better integration of NRDA and remedial activities to reduce duplication of efforts**



NRDA Costs

- “ Significant savings could occur by integration of NRDA and remediation activities
- “ PRPs could participate proactively in providing funds necessary to conduct many of the studies recommended
- “ These studies would be mutually beneficial to directing future remediation activities, as well as quantifying natural resource damages
- “ Absent PRP participation, State’s share of preassessment study is approx. **\$200,000**
- “ Estimated costs to restore damaged natural resources is **\$200 MM**



Cost Estimate Summary

Health Effects	\$ 34,475,000 +\$400,000 per year
Subsidence	\$ 219,111,000
Mine Shafts	\$ 10,250,000
Chat Use	\$ 1,814,000
Drainage/Flooding	\$ 48,465,000
Water Quality	\$ 25,311,190
NRDA	\$ 200,200,000
TOTAL (estimated)	\$ 540,025,190

Cost escalates to
\$10-61 Billion
when filling caverns
to prevent subsidence

Subcommittee Common Themes



- " Need for a steering committee to coordinate & oversee implementation of Task Force recommendations**

- " Development of GIS *ad hoc* group to develop and compile all data/mapping needs for the entire project**
 - One GIS rep from each Subcommittee, plus some "outside" experts
 - Managed by Oklahoma GIS Council



Task Force Action Plan

... Putting all the pieces together



Subcommittee Common Themes



" Utilization of wetlands . . .

- to address chronic drainage & flooding problems (**Drainage/Flooding Subcommittee**)
- to treat mine drainage discharges and lessen its impact on Tar Creek (**Water Quality Subcommittee**)
- to mitigate for approximately \$200 MM worth of damaged natural resources (**NRDA Subcommittee**)

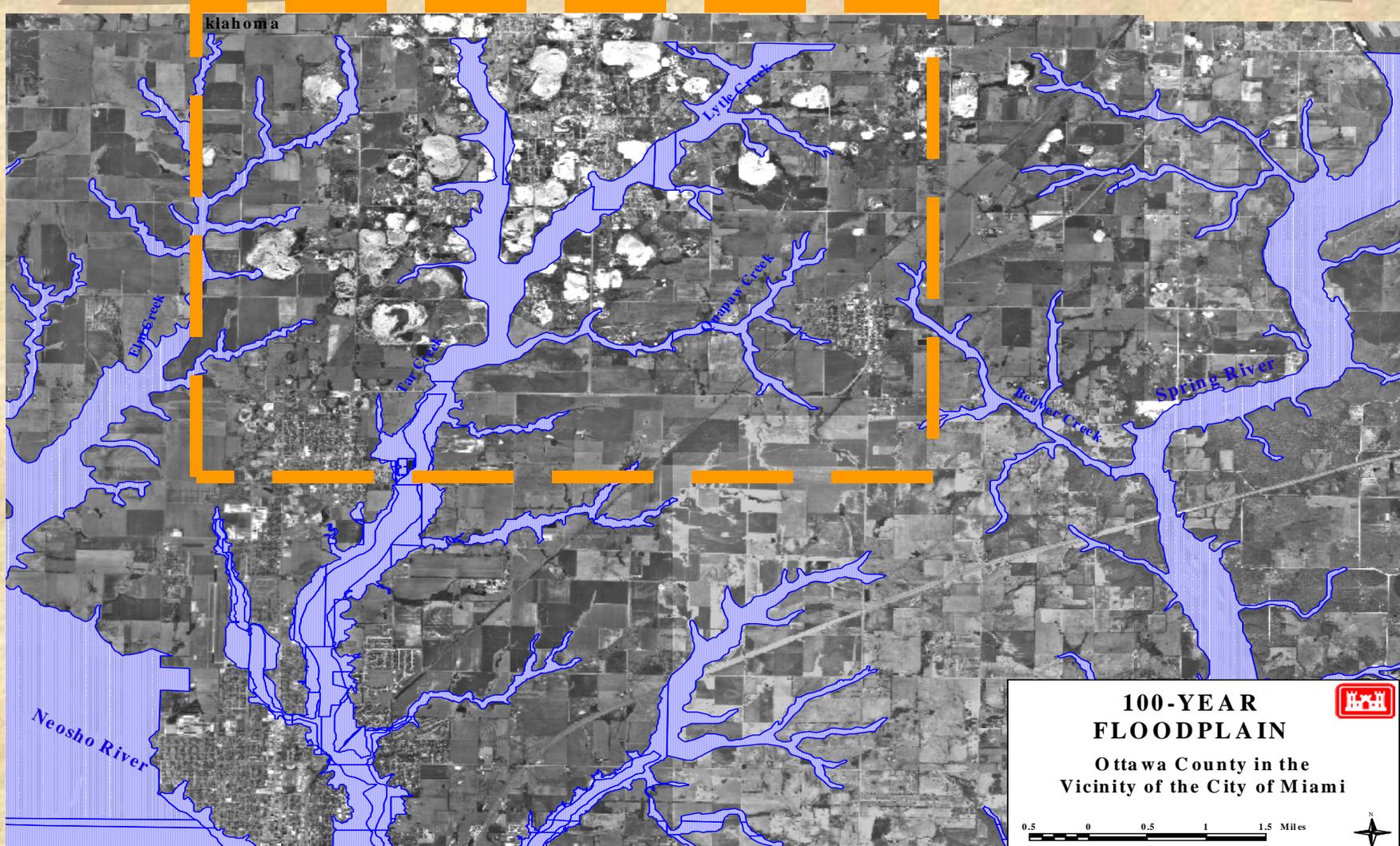


Wetlands Concept

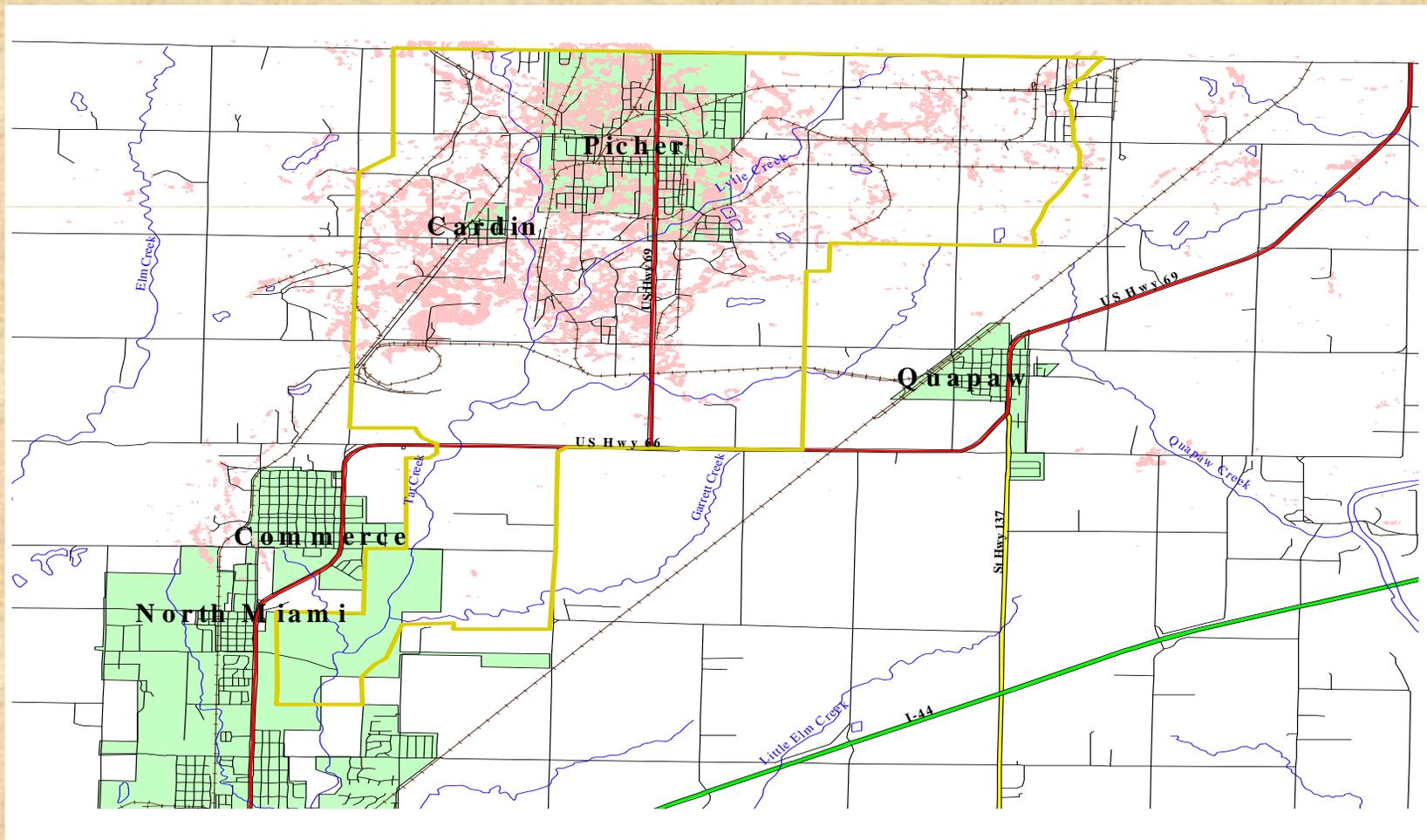
- “ Ecological solution that resolves the majority of the most pressing health, safety, environmental, and aesthetic concerns
- “ Serves as the “vision” for restoring this ravaged landscape



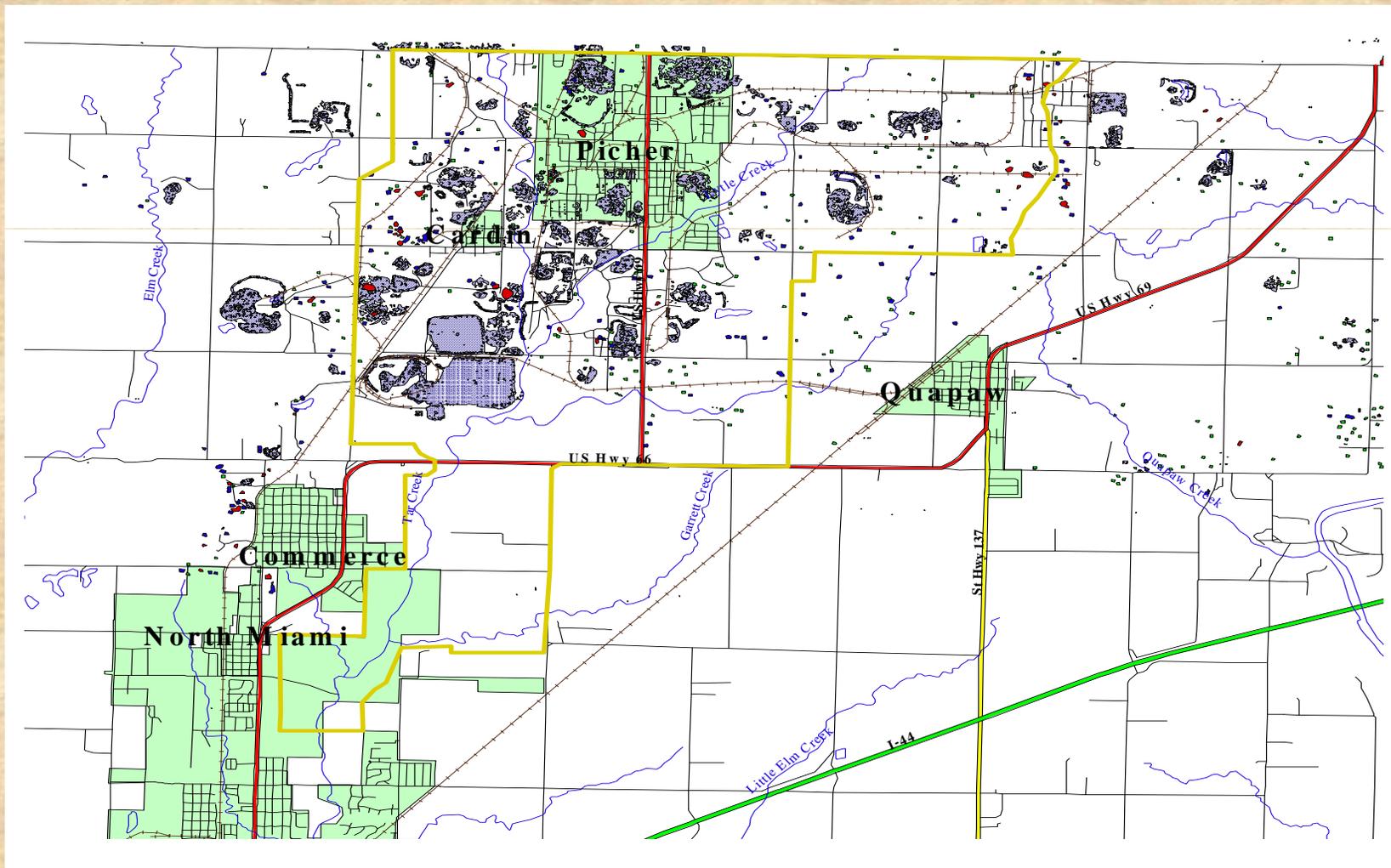
Existing Floodplain Conditions



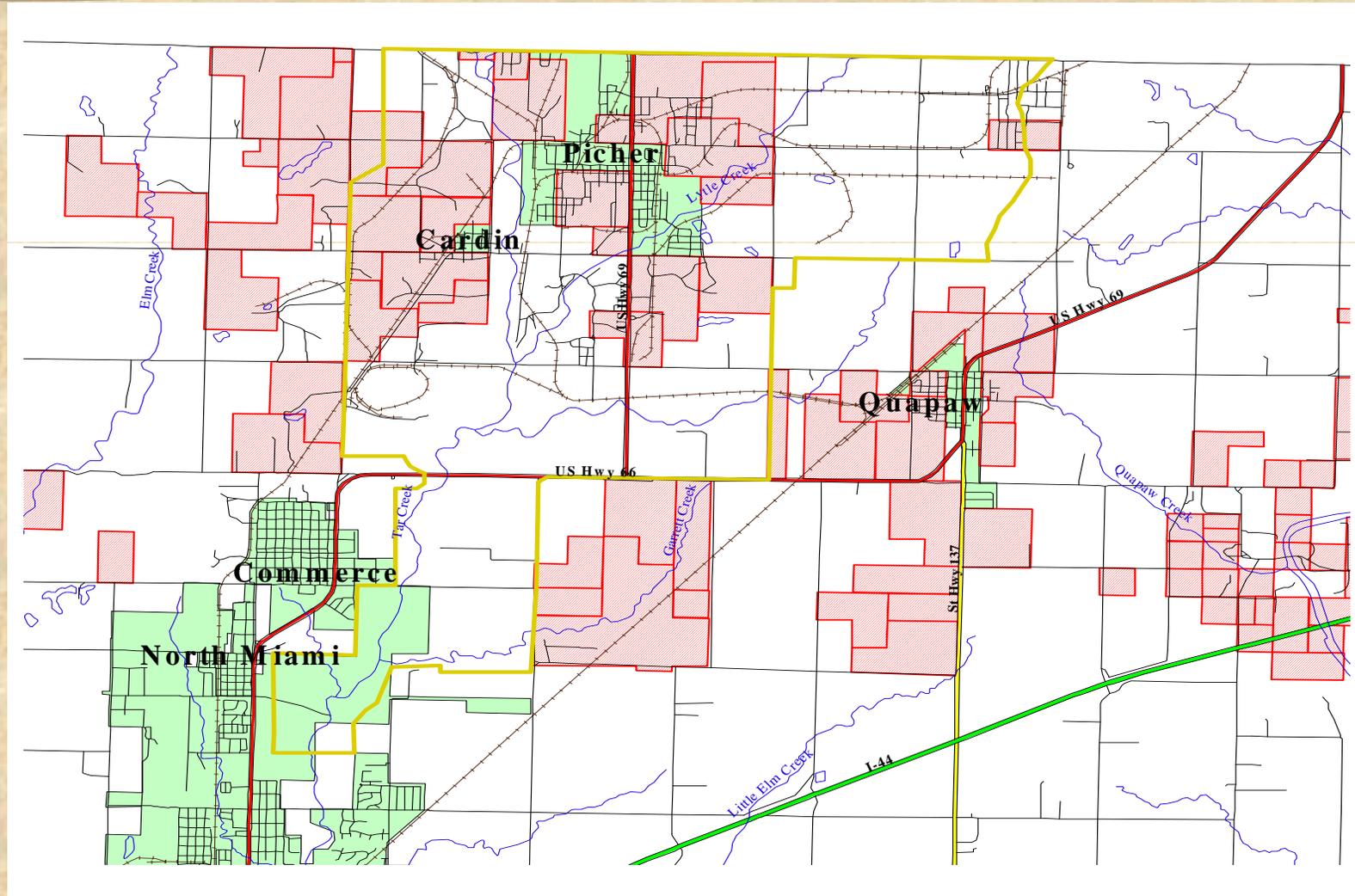
Existing Subsurface Caverns



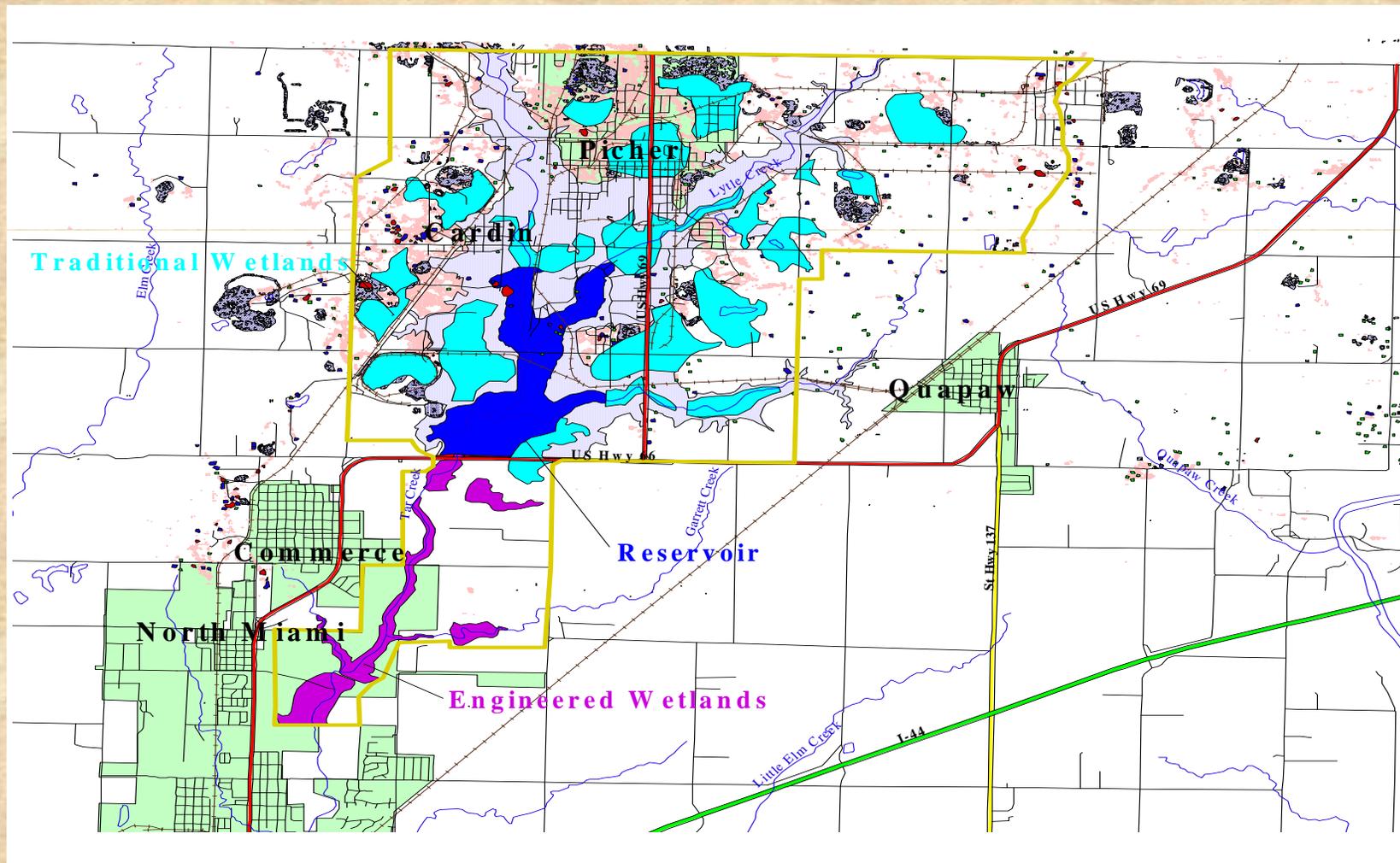
Chat Piles, Shafts, & Collapses



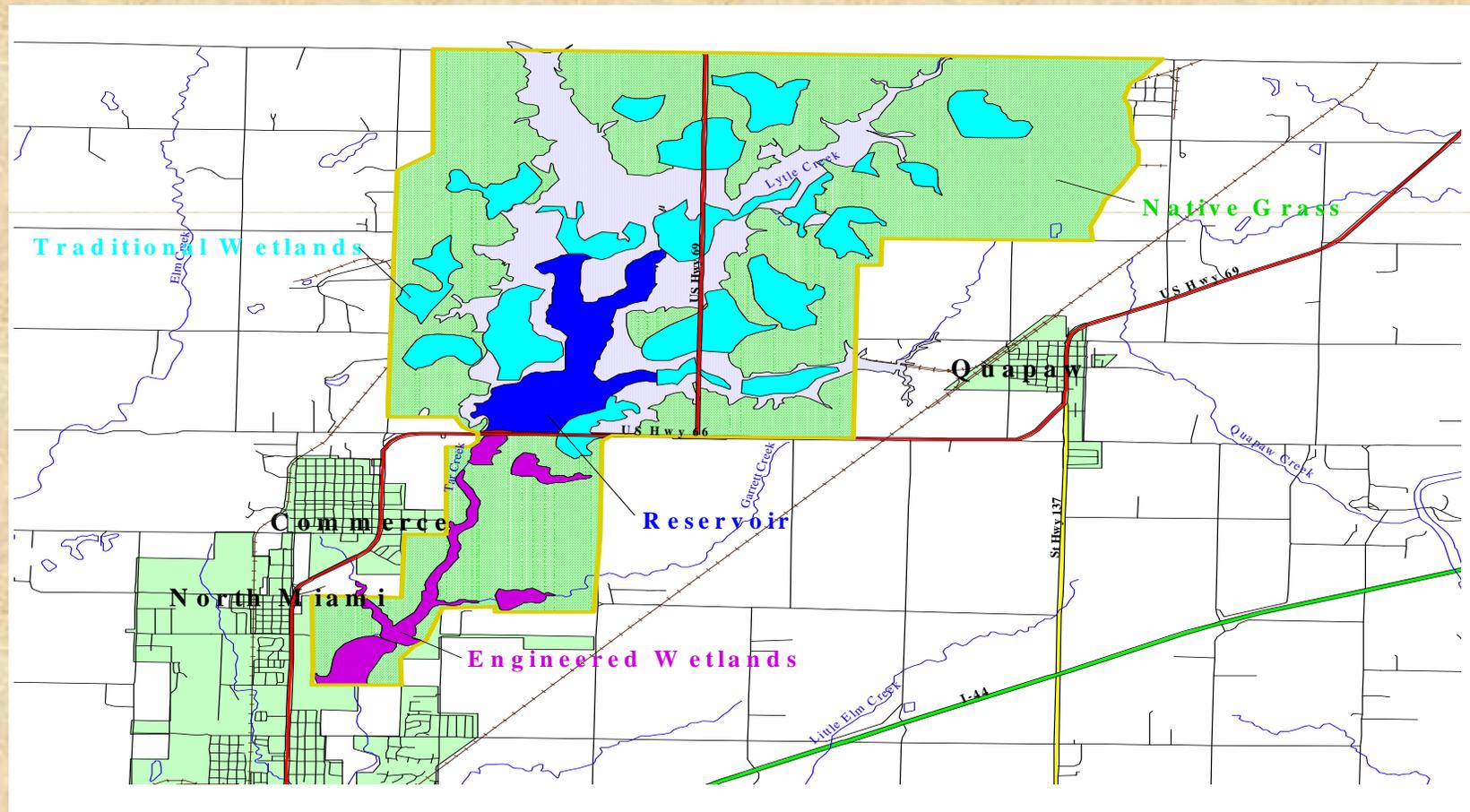
Native American-Owned Land



Proposed Hydrologic Modifications



Proposed Boundary & Land Use



Wetlands Concept: Requirements



" Land acquisition:

- 10,800 acres unimproved land
- 780 houses in Picher/Cardin
- 47 businesses and churches
- 1 school system
- municipal infrastructure

" Construction:

- Reservoir: 546 acres
- Traditional Wetlands: 1694 acres
- Engineered Wetlands: 318 acres



Wetlands Concept: Estimated Costs



Acquisition &
Relocation
Assistance

\$110,000,000

Wetlands &
Reservoir
Construction

\$140,000,000

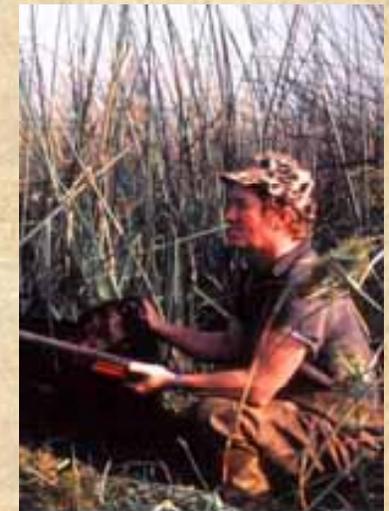
TOTAL

\$250,000,000

Wetlands & Natural Resource Area



Photograph © 1995 by Gregg A. Eckhardt



Wetlands Concept: Unknowns

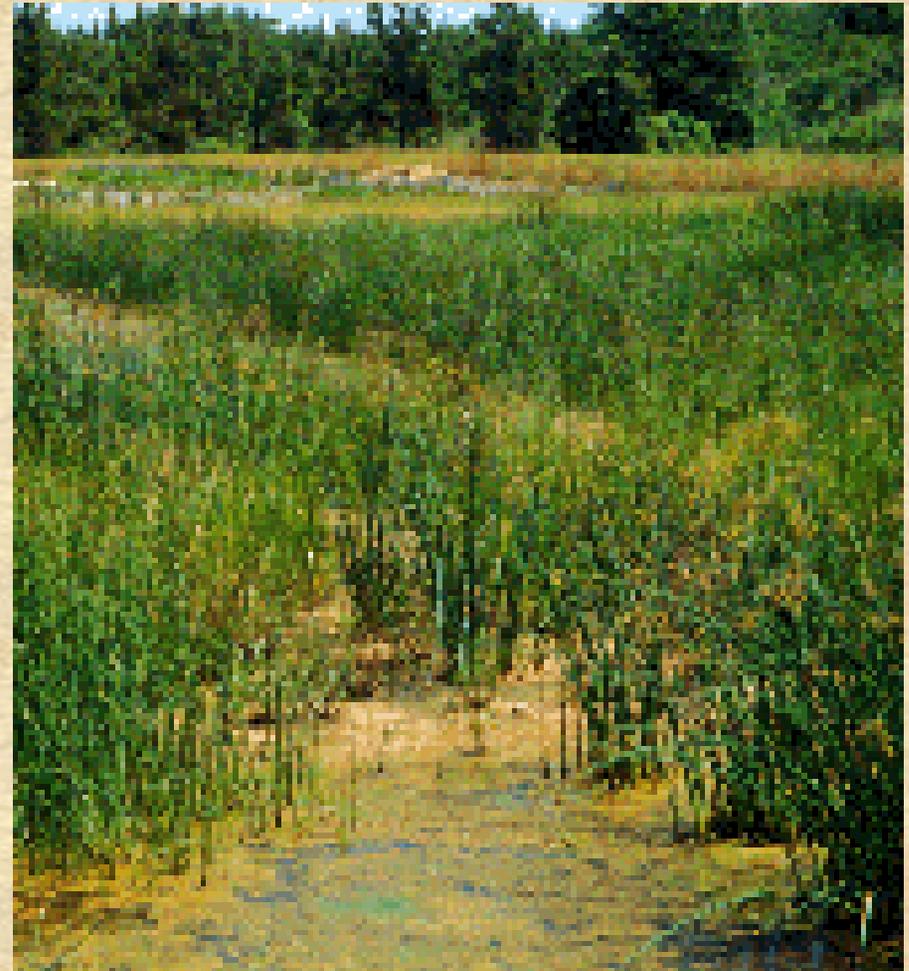


- " Public acceptance
- " Required wetlands acreage for flood control
- " Contaminated flow quantity/concentration
- " Required wetlands acreage for treatment
- " Effectiveness of passive constructed wetland
- " Impact of wetlands on subsidence and *vice versa*

Wetlands Concept: Unknowns



- “ Suitability of chat for drainage layer
- “ Potential impact on fish and wildlife
- “ Acquisition of Tribal Lands and other Real Estate interests
- “ O&M Costs and source of O&M funding





Final Recommendations

- ” Develop RI/FS to include the following:
 - comprehensive study of mine drainage discharges to determine amount & types of treatment wetlands
 - initiate pilot wetland treatment systems to identify most feasible & effective systems for the area



Final Recommendations

" Also include in RI/FS:

- develop and test appropriate uses of high volumes of chat to establish markets for its export
- identify shafts that need plugging to prevent groundwater contamination & pilot various methods
- investigate bioavailability of heavy metals from consuming wild forage foods (human & wildlife)



Final Recommendations

“ Assemble local steering committee to explore options & feasibility of Picher/Cardin relocation

- Mayors of Picher & Cardin
- Picher Housing Authority
- Quapaw Tribe Chair
- Ottawa Co. Health Dept.
- Picher/Cardin business
- State Senator, Dist. 1
- State Rep., Dist. 7
- Governor's Task Force
- U.S. Rep., Dist. 2
- U.S. Senator(s)
- U.S. EPA
- U.S. HUD
- U.S. DOT/ODOT
- U.S. BIA



Final Recommendations

- " **Create GIS *ad hoc* committee to compile all available data & information on the Superfund area**
 - Coordinated by Oklahoma GIS Council
 - one rep from each Task Force Subcommittee
- " **Establish local industrial authority to develop infrastructure & appropriate regulatory climate for large-scale, aggressive chat marketing and export**



Final Recommendations

- " Continue Governor's Task Force to oversee progress on studies & investigations (meet quarterly)**
- " Maintain Task Force Subcommittees to address issues as they arise**
- " Develop EPA, DOI, Tribal & State partnership to hasten cost recovery/NRDA reimbursement (another source of \$ for Concept Plan)**

Task Force Recommendation

" Pursue development of a world-class wetlands area and wildlife refuge within the boundaries of the Tar Creek Superfund Site that will serve as an ecological solution to the majority of the most pressing health, safety, environmental, and aesthetic concerns identified by the Task Force.