

Phosphate Mining in the Bone Valley

Mark Peterson

Tampa Permits Office

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US Army Corps of Engineers
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JACKSONVILLE DISTRICT

Phosphate History

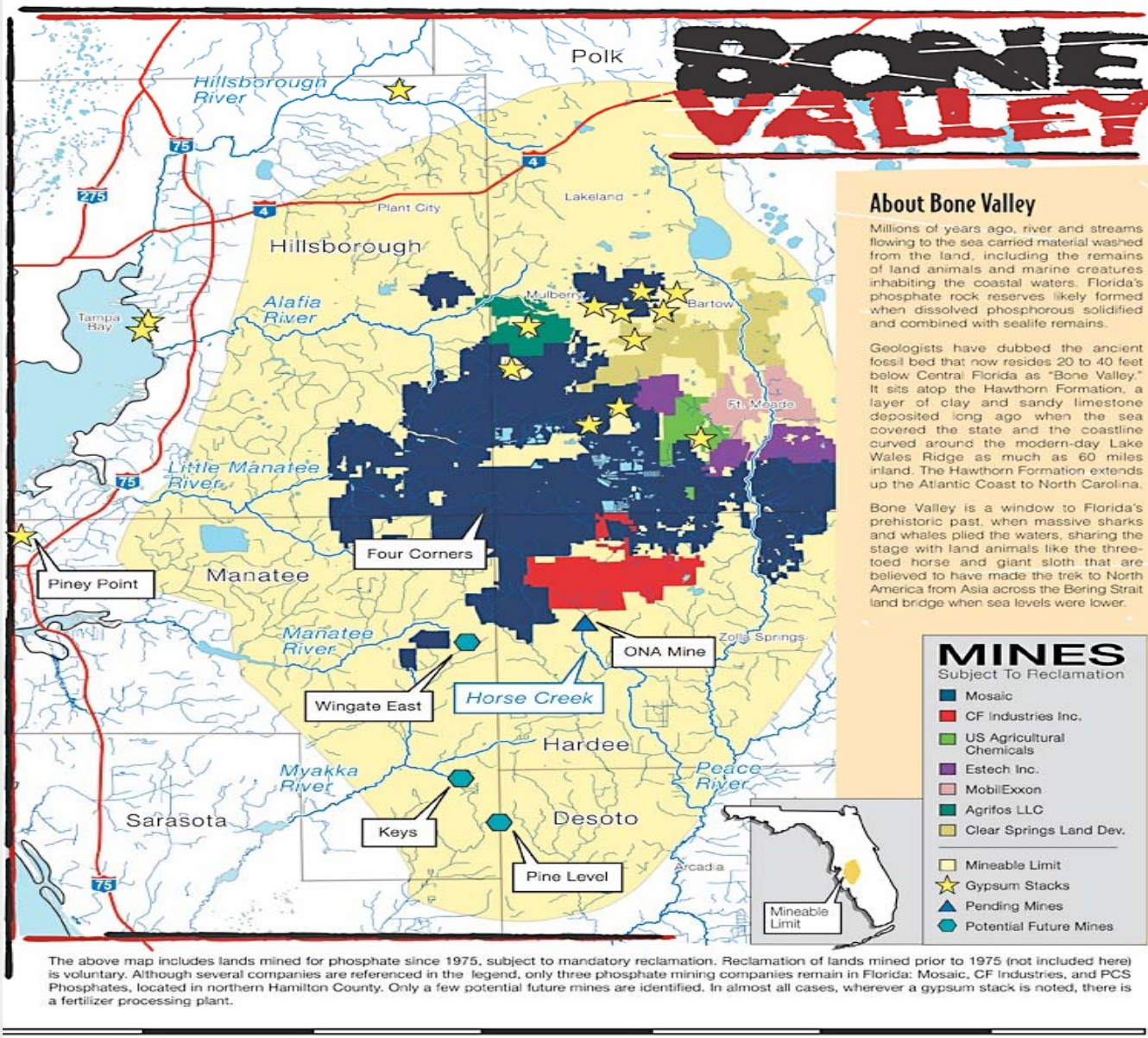
- River Pebble Phosphate was discovered along the Peace River in 1881.
- Early mining was by hand using wheelbarrows, picks and shovels.
- Mechanized excavation began between 1900 and 1905 with steam shovels.
- Draglines first utilized in the 1920s and 1930s.
- Technological advancements allowed miners to move from the river-pebble to the land-pebble and hard-rock phosphates, and then to mining the finer-grained “phosphate matrix”
- Phosphate matrix occurs over a wide area of west-central Florida known as the “Bone Valley”.
- In 1900 it took 3-4 years to mine 15 acres with picks and shovels. In the early days of the small draglines, about 5 acres were mined in a year.
- As draglines grew in size, companies were able to mine 500-600 acres a year. Currently, draglines are able to mine 15 acres a month.



Source:
<http://www.lakelandgov.net/library/oldspeccoll/fscsan/phos1a.htm>



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Source:
www.baysoundings.com



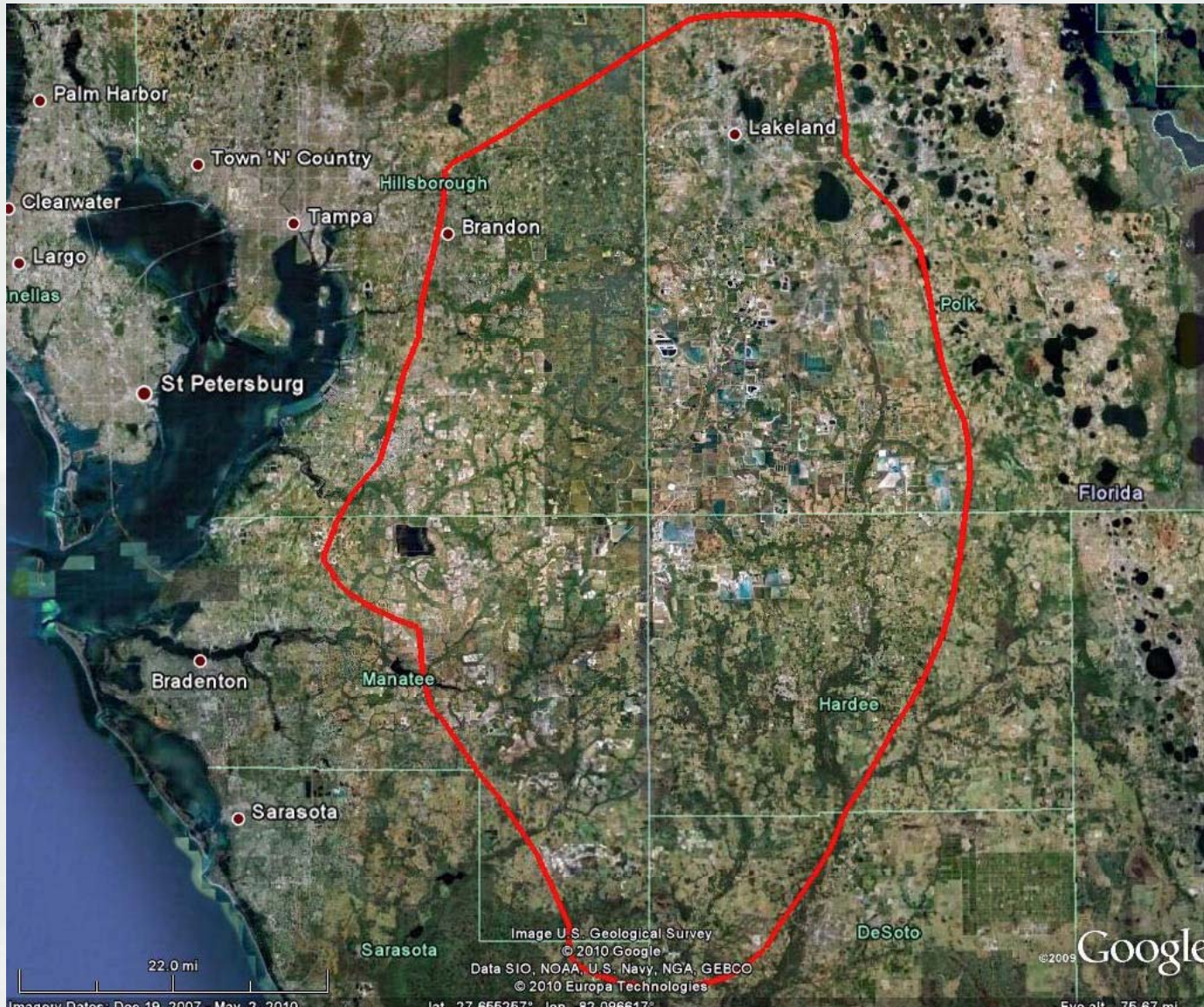
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Central Florida Phosphate Region “Bone Valley”

- Geologist named the Florida phosphate reserve “Bone Valley”.
- The Central Florida Phosphate Region consists of Hillsborough, Polk, Hardee, DeSoto and Manatee Counties .
- Watersheds include the Alafia River Watershed, the Peace River Watershed, the Manatee River Watershed, the Little Manatee River Watershed and the Myakka River Watershed.
- Current Phosphate mining companies: Mosaic and CF Industries.
- One mine has operated outside of Bone Valley in Hamilton County in North Florida.



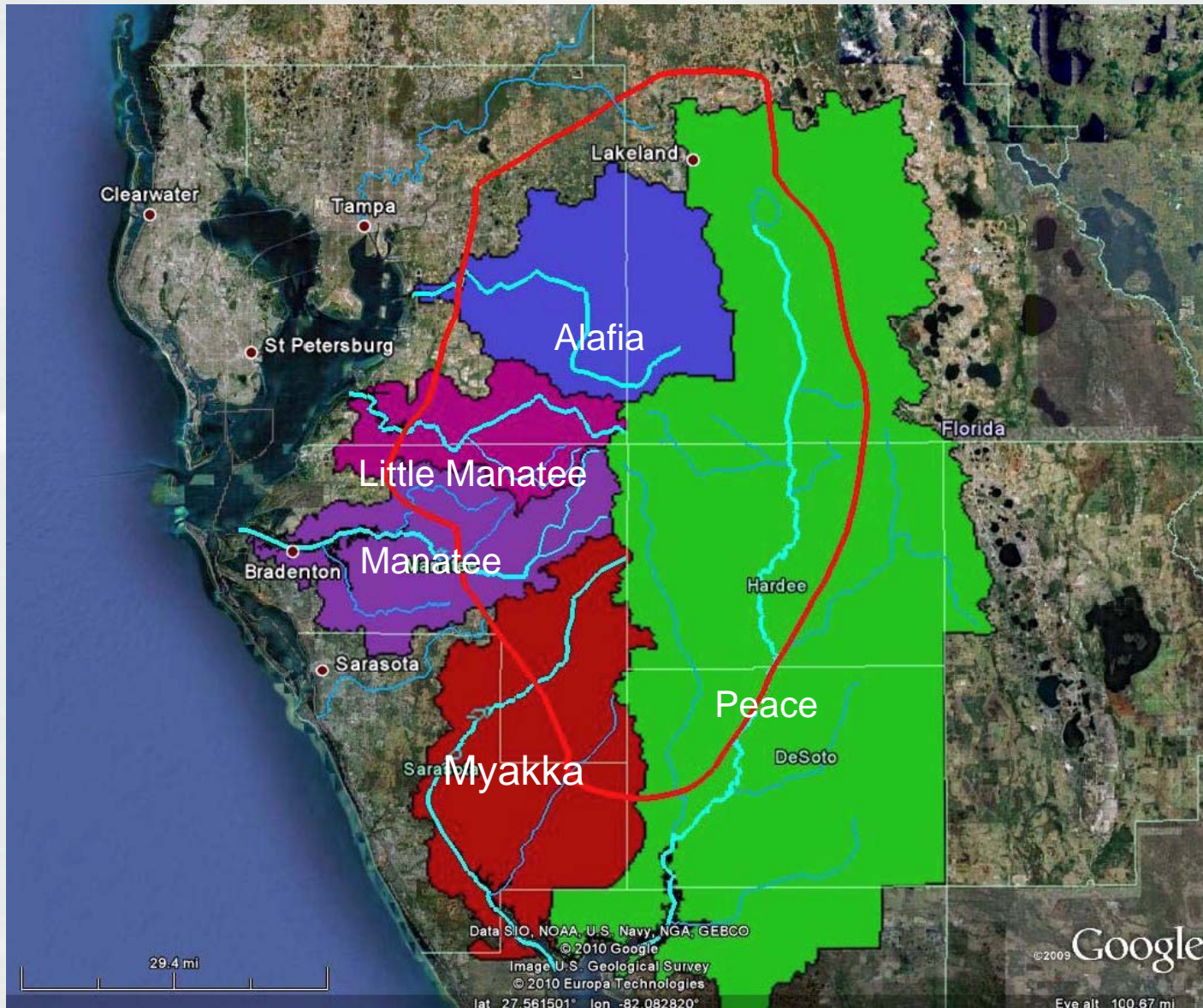
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Central Florida Phosphate Region "Bone Valley"

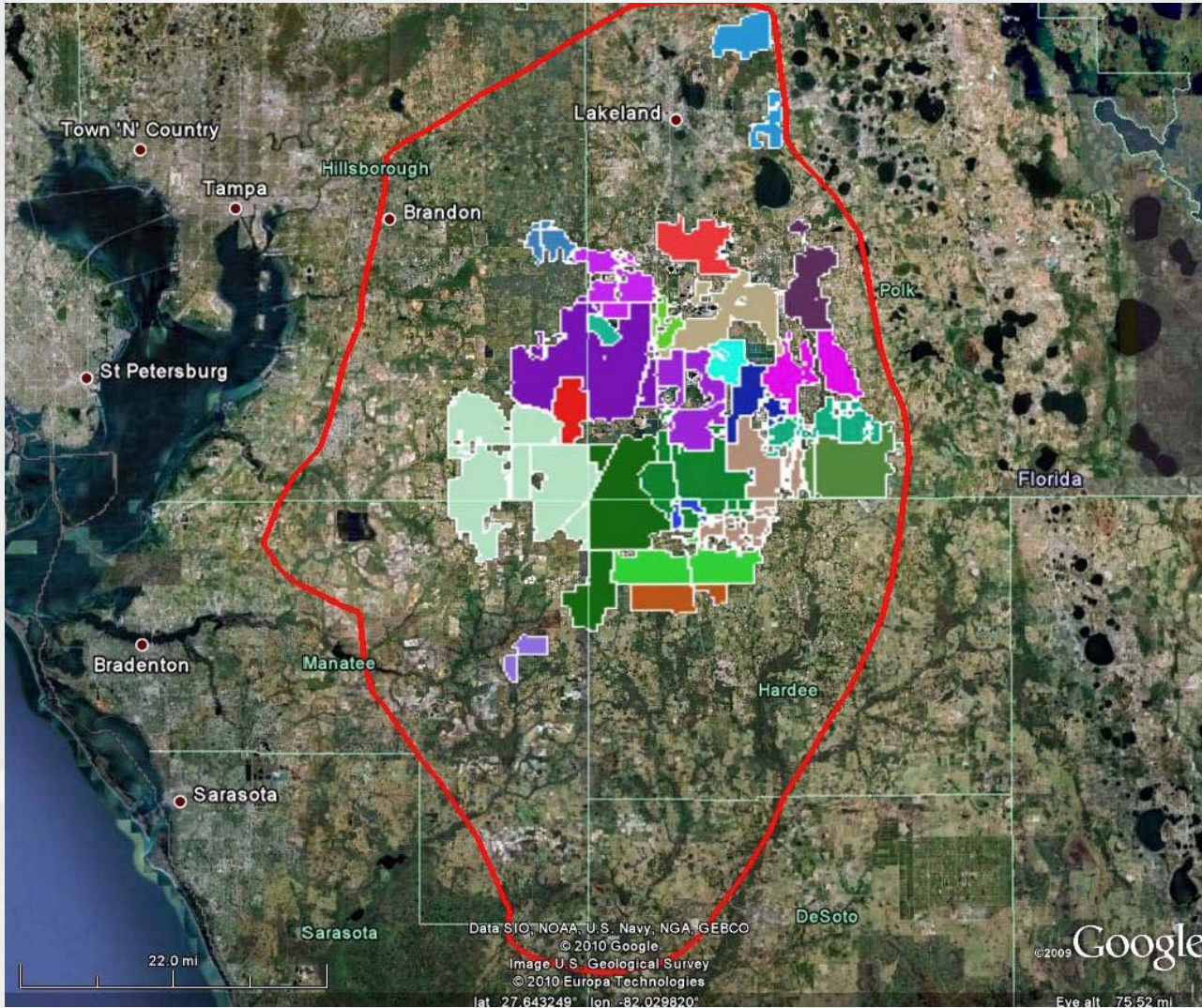


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Major Rivers & Watersheds





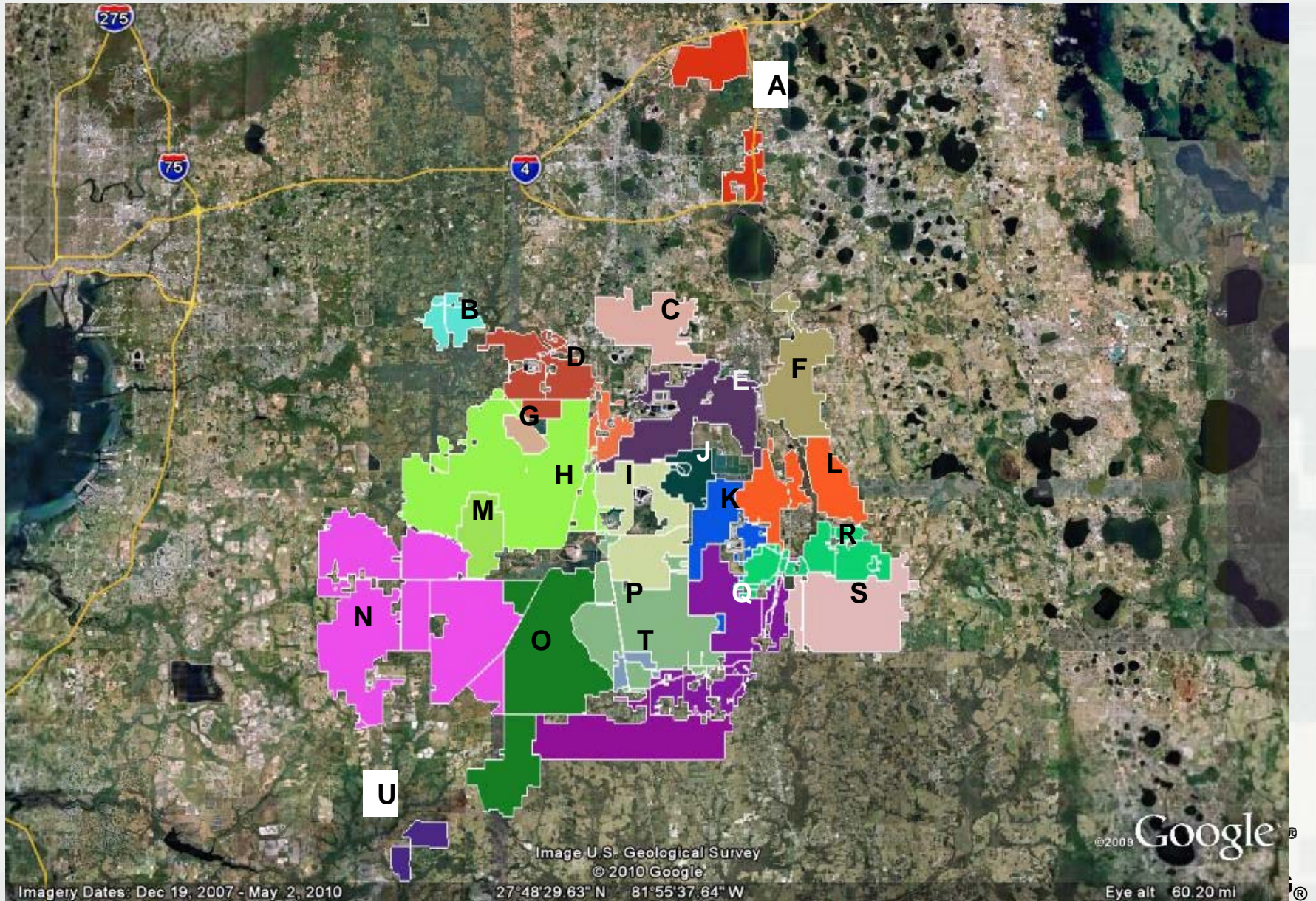
Existing Phosphate Mines

Source: FDEP Bureau of Mining and Minerals Regulation



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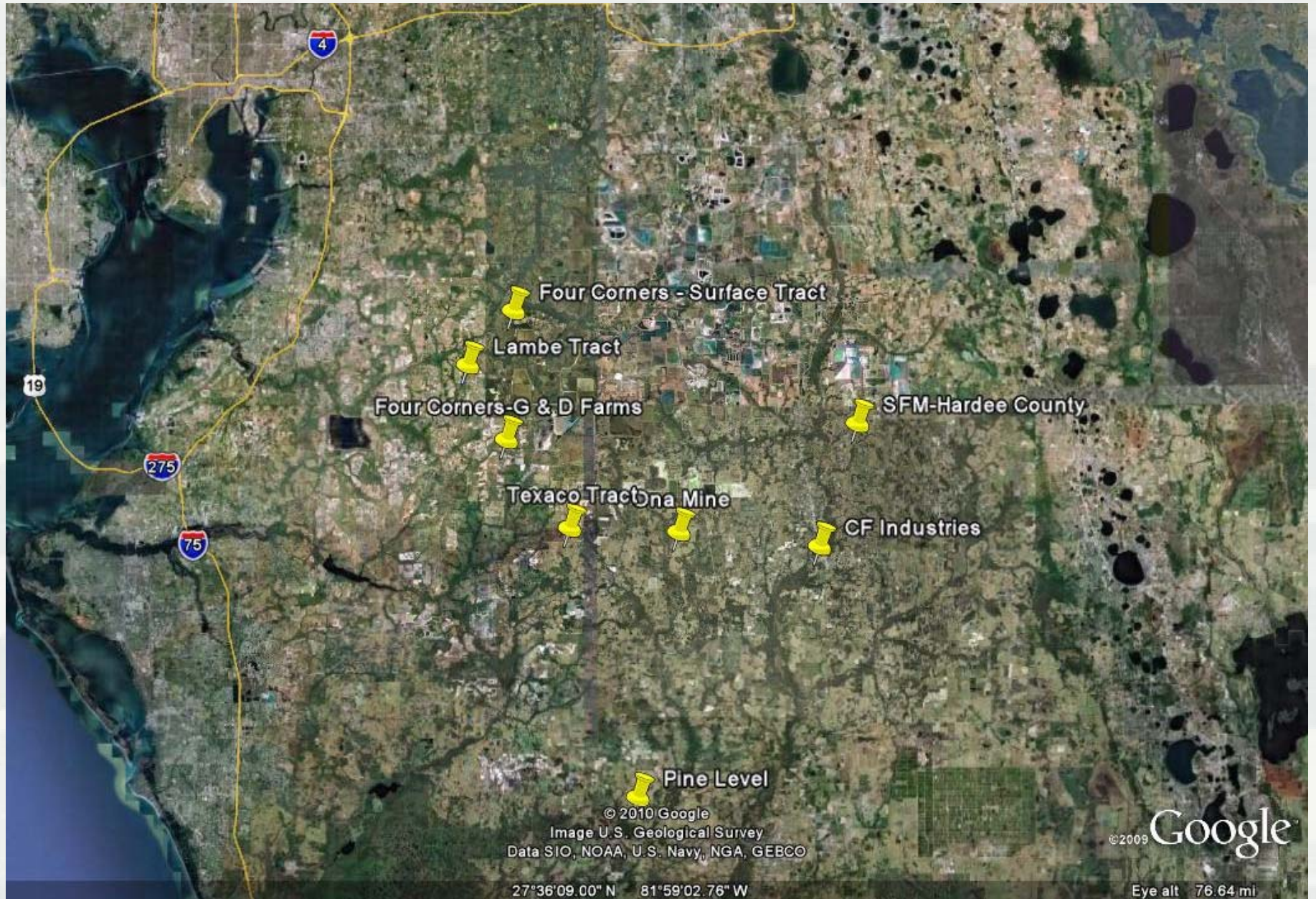
2005 SFWMD Existing Phosphate Mine Data



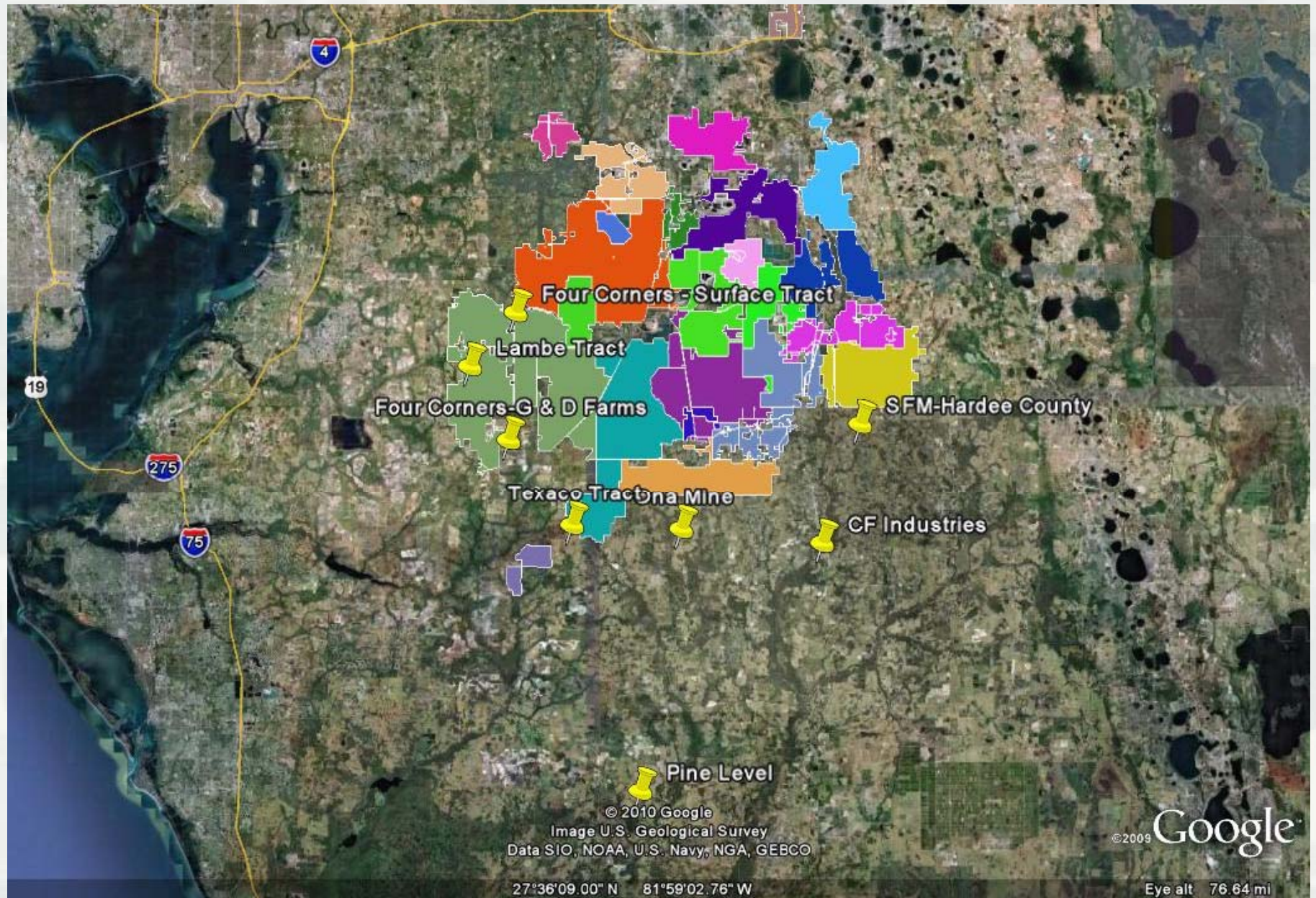
2005 SFWMD Existing Phosphate Mine Spreadsheet

| | Mine Name | Year Mining Began | Company | Acres | Status |
|----|-----------------------|-------------------|---------------|---------|-----------------------|
| A. | Saddle Creek Mine | 1982 | Williams Co. | 9963.89 | shut down |
| B. | Hopewell | 1989 | Mosaic | 4111.89 | active |
| C. | Bonny Lake | 1975 | Mosaic | 10234.2 | shut down |
| D. | Nichols | 1975 | Mosaic | 10539 | shut down |
| E. | Noralyn | 1975 | Mosaic | 16374.4 | shut down |
| F. | Clear Springs | 1975 | Mosaic | 11061.8 | shut down |
| G. | New Wales | 1975 | Mosaic | 2086.22 | inustrial use |
| H. | Kingsford Complex | 1975 | Mosaic | 37917.1 | active |
| I. | Hookers Prairie | 1977 | Mosaic | 14526.5 | active |
| J. | Silver City | 1975 | Estech | 4559.58 | shut down |
| K. | Rockland | 1975 | US Agri Chem. | 7577 | shut down |
| L. | Mobil Fort Meade | 1975 | MobilExxon | 13255 | shut down |
| M. | Big Four | 1978 | Mosaic | 5962.03 | active |
| N. | Four Corners Lonesome | 1985 | Mosaic | 51675.6 | active |
| O. | Fort Green | 1975 | Mosaic | 31304.9 | active |
| P. | Payne Creek | 1975 | Mosaic | 21782.2 | active |
| Q. | Mosaic Fort Meade | 1975 | Mosaic | 18542.4 | temporarily shut down |
| R. | Watson | 1975 | Estech | 10768.8 | shut down |
| S. | South Fort Meade | 1995 | Mosaic | 17276.9 | active |
| T. | North Pasture | 1978 | CF Inustries | 1673.94 | shut down |
| U. | Wingate Creek | 1981 | Mosaic | 3128.01 | active |

Current Pending Phosphate Applications as of August 2010



Pending Phosphate Applications with 2005 SFWMD Mine Layer



Phosphate 101

- Phosphate is a natural, non-renewable resource that is obtained by mining phosphate-containing minerals.
- Florida's phosphate rock deposits are believed to have originated when conditions in the seawater caused dissolved phosphorus to solidify and form the sediment that is mined today. Sea life also played a big part in forming the sediment deposits.
- Approximately 90 percent of the phosphate that is mined is used to produce phosphate fertilizers. There are no substitutes for phosphorus in agriculture.
- The United States produces the most phosphate in the world, while Morocco and China rank second and third, respectively. Active mining is also occurring in Morocco, China, Russia, Tunisia, Jordan, Brazil, Israel, South Africa, Syria and Togo.
- U.S. Phosphate reserves found in Central Florida, North Carolina, Utah and Idaho.
- Florida is presently providing approximately 75 percent of the nation's supply of phosphate fertilizer and about 25 percent of the world supply.



Phosphate 102

- Florida's typical phosphate ore (matrix) is found about 15-50 feet below the earth's surface and is about 10-20 feet thick.
- Phosphate rock is mined and then manufactured through the fertilizer manufacturing process.
- A typical Florida phosphate mine gets about 9,000 tons of phosphate rock per acre of land.
- By 1999, approximately 300,000 acres of land, or more than 460 square miles, (out of Florida's total land area of 54,000 square miles) had been mined in Florida .
Source: Florida Institute of Phosphate Research (FIPR)



Source:

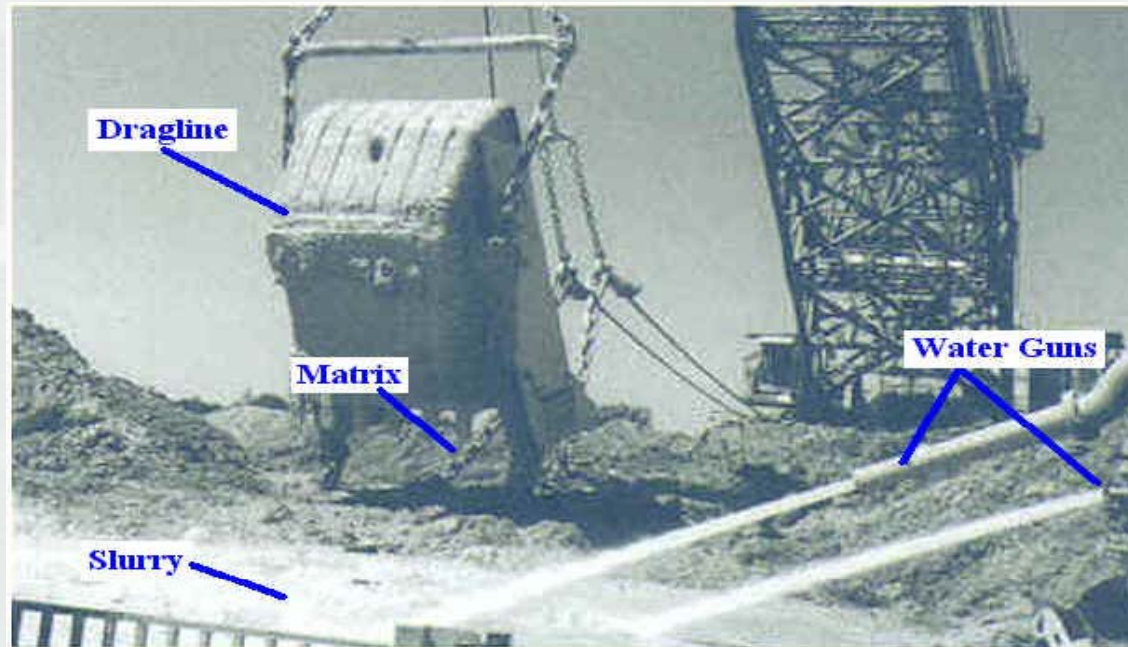
<http://www.baysoundings.com/sum05/phosphate4.html>



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Mining Process

- After land clearing activities, the dragline bucket scoops the top 15-30 feet of earth know as “overburden”.
- The dragline then digs out the matrix, which consists of equal parts of phosphate rock, clay and sand.
- Matrix is then dumped in a pit where high-pressure water guns create a slurry that can then be pumped to the beneficiation plant, which can be up to 10 miles away. At the beneficiation plant the phosphate is separated from the sand and clay.
- The Clay by product is stored in clay settling areas and the Sand is reused for reclamation.



Source: <http://www.fipr.state.fl.us/ar99/miningpop3.jpg>

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Clay Settling Areas

- Clay is part of the matrix that phosphate companies mine. The matrix contains roughly equal parts of clay, sand and fluorapatite, a phosphate mineral.
- A typical Florida phosphate mining operation pumps more than 100,000 gallons of water carrying tiny particles of clay every minute in the mining process.
- The phosphate industry leaves about 40% of the land it mines behind in clay settling areas.



Phosphogypsum

- Phosphogypsum is a by-product of the chemical reaction called the "wet process," whereby sulfuric acid is reacted with phosphate rock to produce the phosphoric acid needed for fertilizer production.
- Phosphate rock becomes associated with the phosphogypsum after the rock is reacted with sulfuric acid.
- There are currently about 1 billion tons of phosphogypsum stacked in 25 stacks in Florida (22 are in central Florida) and about 30 million new tons are generated each year.



“Gypsum Stack”



Source: <http://www.epa.gov/rpdweb00/images/tenorm/stack-side.jpg>



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Reclamation

- The State of Florida mandated that all land mined after July 1, 1975 must be reclaimed.
- Phosphate permitting and reclamation is reviewed by the Florida Department of Environmental Protection Bureau of Mining Reclamation.
- Reclamation consists of both upland and wetland restoration.
- According to the Florida Institute of Phosphate Research, the Phosphate Industry has indicated that 41% (28,248 acres) of post-1975 mined land have been reclaimed.



Corps Regulation

- The U.S. Army Corps of Engineers began regulating the discharge of dredged or fill material in waters of the U.S. (including wetlands) on July 1, 1977, the effective date of Phase III of the Clean Water Act. (Section 404, Clean Water Act of 1977)
- A wetland is an area that is inundated or saturated at a duration sufficient to support and that under normal circumstances supports a prevalence of vegetation typically adapted for life in saturated soil conditions.



Permit Decision Making

- 404(b)(1) Guidelines
- Public Interest Review
- National Environmental Policy Act (NEPA)
- Other Applicable Federal Laws (E.G. ESA, NHPA, EFH)
- State & Territorial Certifications (CZM, WQC)



Permit Decision Making (cont.)

- **Project Purpose**

Sequential Process:

Avoidance

Minimization

Compensation – Mitigation

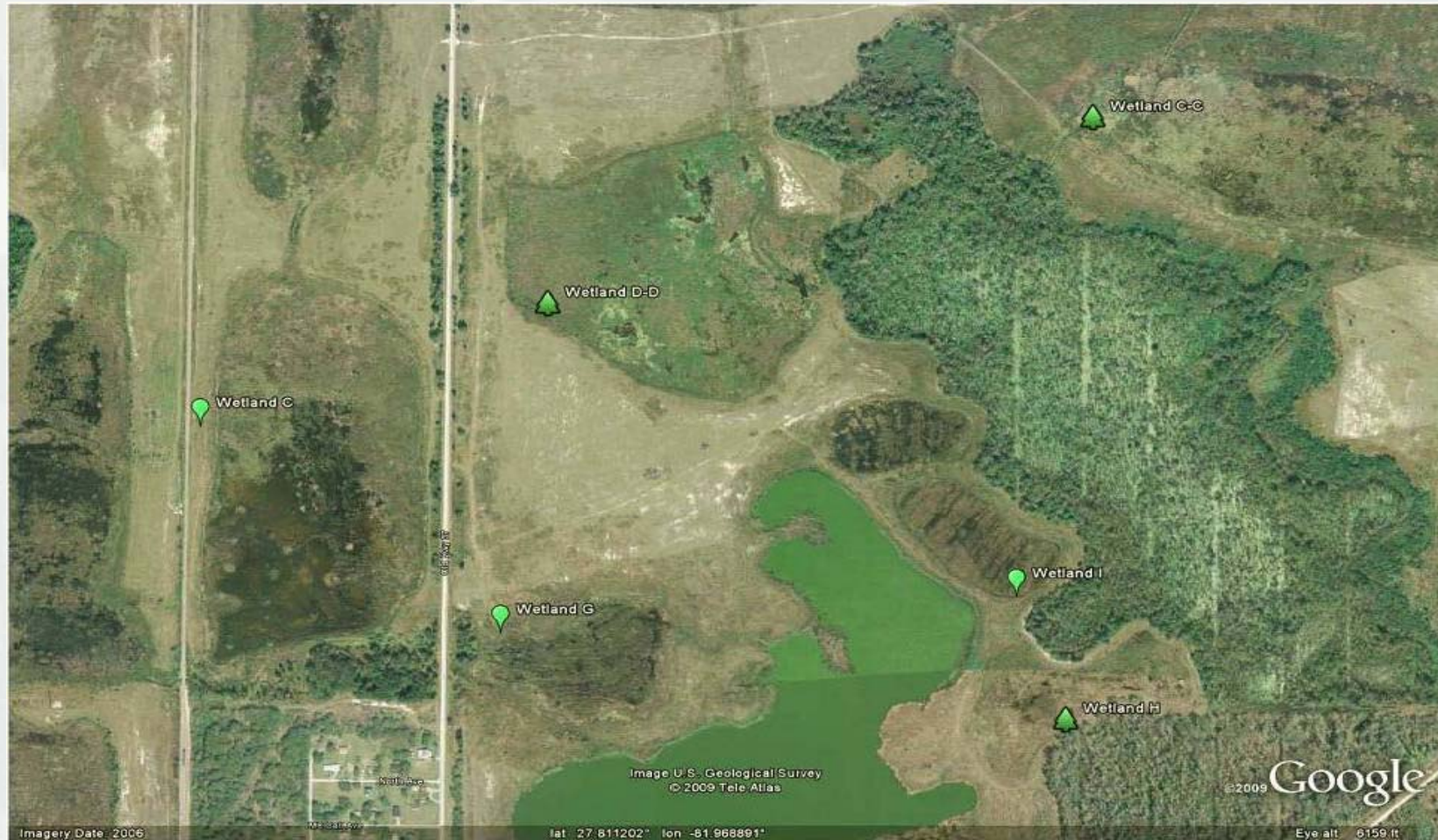
- **Corps Determines Least Environmentally Damaging Practicable Alternative**

- **Corps Reviews Mitigation Proposal (No Net Loss of Wetland acreage and function)**



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Wetland Mitigation Sites



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Mitigation Wetlands

Wetland H



Wetland D-D



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Additional Information

- Florida Institute of Phosphate Research (FIPR)
<http://fipr1.state.fl.us/PhosphatePrimer/0/C0E6FF4202BB60D685256F77005D2847>
- Florida DEP Mining and Minerals Regulation
<http://www.dep.state.fl.us/water/mines/>
- Watershed Data
http://www.protectingourwater.org/watersheds/map/sarasota_bay_peace_myakka/peace/
- Peace River Cumulative Impact Study
http://www.dep.state.fl.us/water/mines/pr_cis-final.htm
- U.S. Army Corps of Engineers – Jacksonville District
<http://www.saj.usace.army.mil/Divisions/Regulatory/index.htm>

