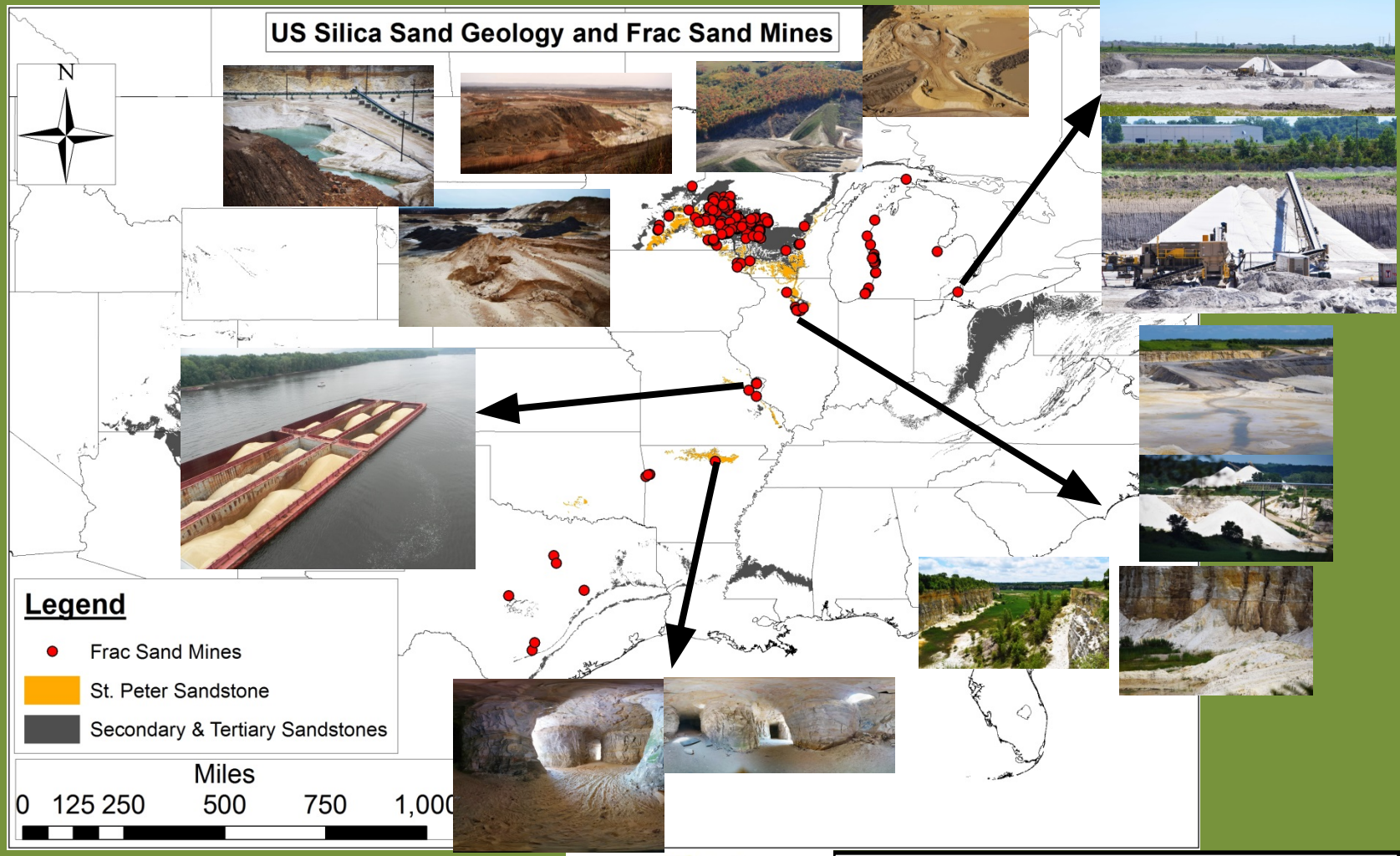
The Influence of Frac Sand Mining On The Landscape



THE GEORGE GUND FOUNDATION

Save The Hills Alliance, Inc

Ted Auch, PhD
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Pictures As Data Conjure Up Images of a Certain Children's Book









LIGHTHAWK
CONSERVATION FLYING

Silica Sand Production Then & Now

- **THEN – Formerly the Riley and Hickory (Brady) formations in Texas and Old Creek formation in Oklahoma (aka, "Brady Brown").**
  - Fewer regulatory hurdles, cheap, close to original plays, and far from population centers
    - **But stuff is angular/blocky and coarse**
  - Similarly angular blocky Cretaceous-Miocene formations exist in the US east coast; The Hickory and St. Peter formations accounted for 90% of US frac sands during the initial stages of the US horizontal drilling boom, while the St. Peter and Brady formations account for 70-80% of production today; the Jordan has been producing since 2005
- **NOW – St. Peter (Ottawa) underlying much of southern Wisconsin and Minnesota, Iowa, and northern Illinois and Missouri (Ordovican).**
  - Secondary but less productive formations include the Jordan, Wonewoc, and Mt. Simon formations (Cambrian)
  - Fine and spherical, crush resistant, acid soluble, clay/silt "free", requires less to no resin coating
    - **Labeled "Silica Arabia" by industry journalist Mike O'Driscoll**
    - Subject to far more river/stream and wind reworking
- **Great Lakes region producing sands across grain size requirements**

Not Your Parent's Sand

Quartz-rich Minnesota sand grains (aka, Silica Sand)

Typical "glacial" sand on top of bedrock (aka, Sand & Gravel Sand)

- Good Ol' Fashion "Brady Brown"

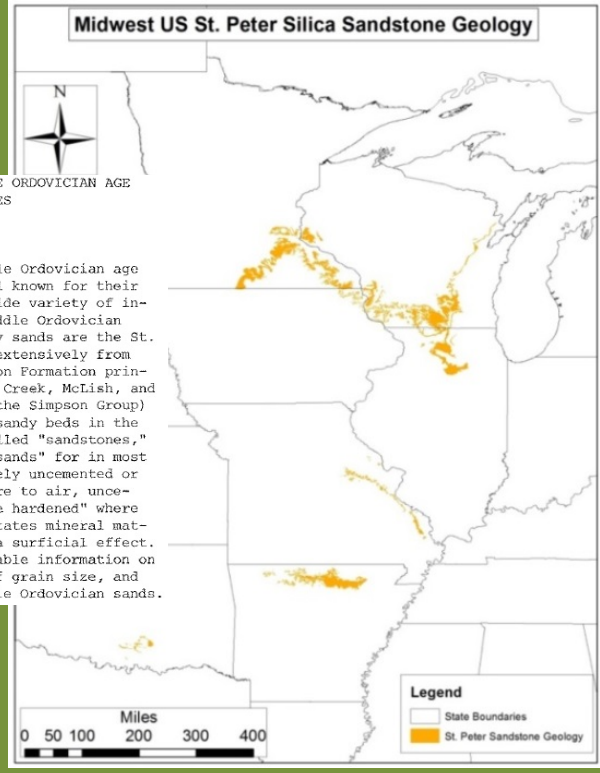
National “Sand Plays”

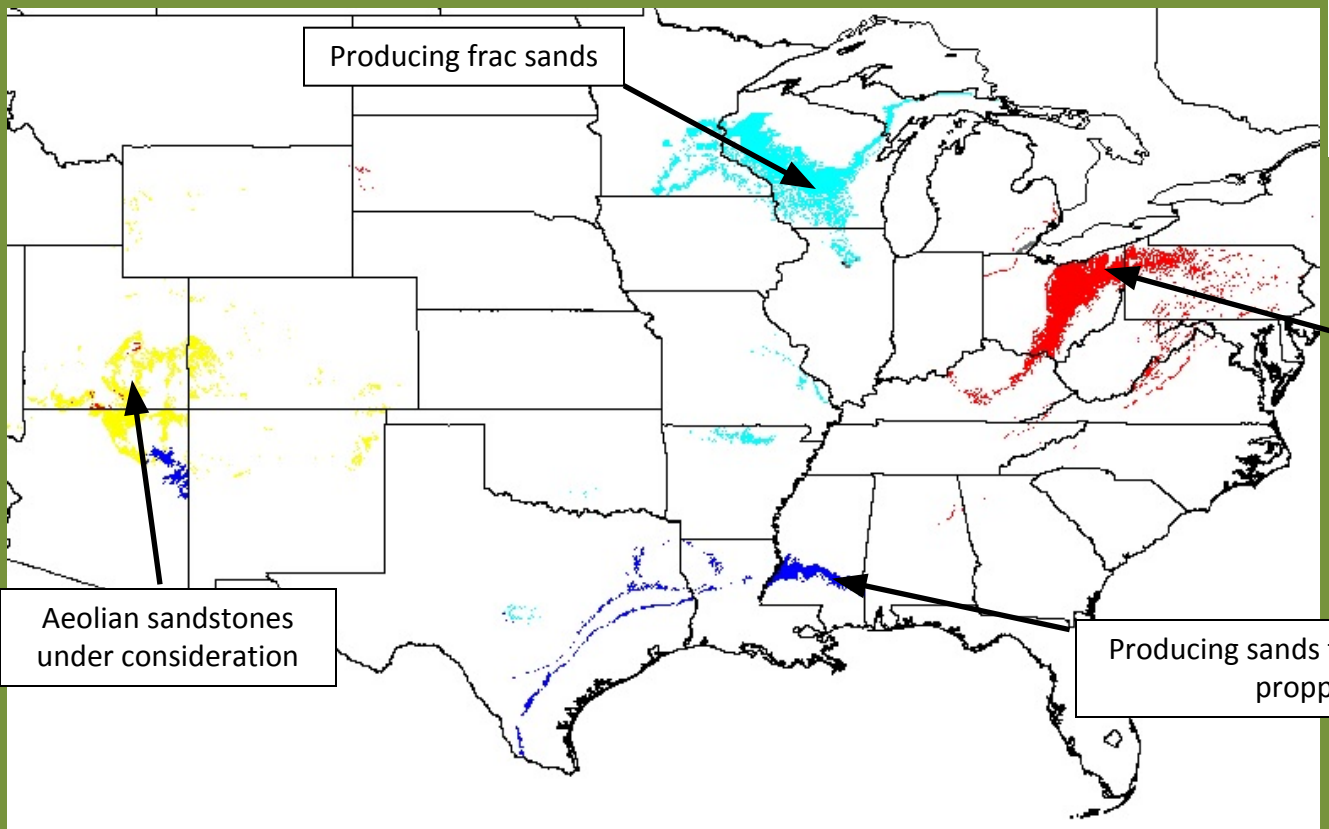
- **The St. Peter Sandstone (SPS)**
  - **First reference was USGS’s Keith Ketner in 1979**
- **Secondary & Tertiary Plays**
  - **83,725 square miles across 16 states or 9.5* the St. Peter**

HIGH-PURITY SILICA SAND OF MIDDLE ORDOVICIAN AGE IN THE MIDWESTERN STATES

By Keith B. Ketner

Certain quartz sands of Middle Ordovician age in the Midwestern States are well known for their purity and are exploited for a wide variety of industrial uses. The principal Middle Ordovician formations containing high-purity sands are the St. Peter Sandstone which crops out extensively from Minnesota to Arkansas; the Everton Formation principally of Arkansas; and the Oil Creek, McLish, and Tulip Creek Formations (all of the Simpson Group) of Oklahoma. The St. Peter and sandy beds in the other formations are commonly called "sandstones," but a more appropriate term is "sands" for in most fresh exposures they are completely uncemented or very weakly cemented. On exposure to air, uncemented sands usually become "case hardened" where evaporating ground water precipitates mineral matter at the surface; but this is a surficial effect. This report summarizes the available information on the extent of exposures, range of grain size, and chemical composition of the Middle Ordovician sands.





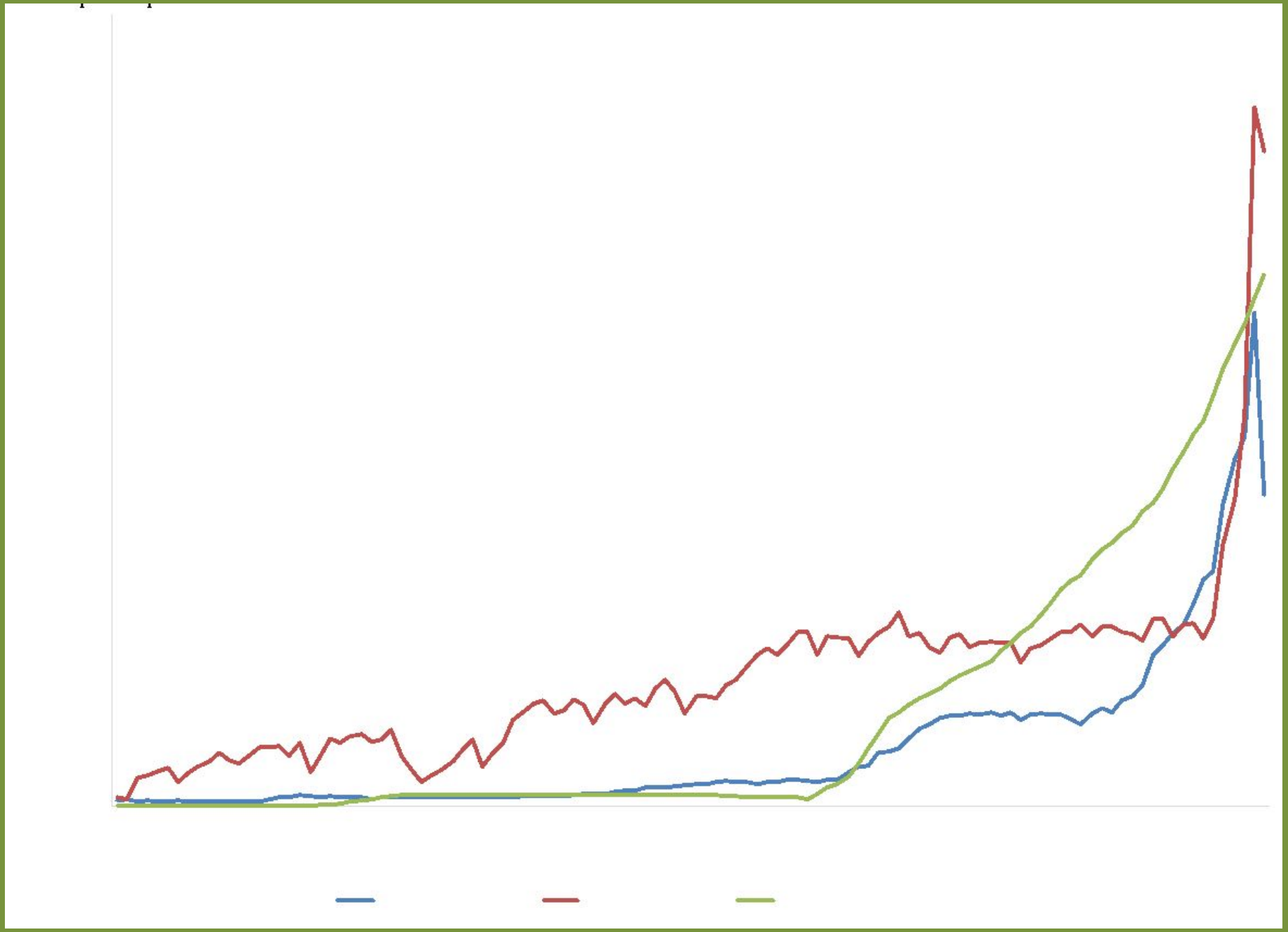
Not Your Parent's Sand

- Frac Sands being explored with surface/strip-mining methodologies across primary silica basins in Great Lakes
  - Very fine stuff 212-850 micrometers; ≥ 0.6 Sphericity and Roundness
  - Closer to the surface (i.e., theoretically less overburden)
  - Equitable across desired grains classifications

Silica Supply/Demand Economics

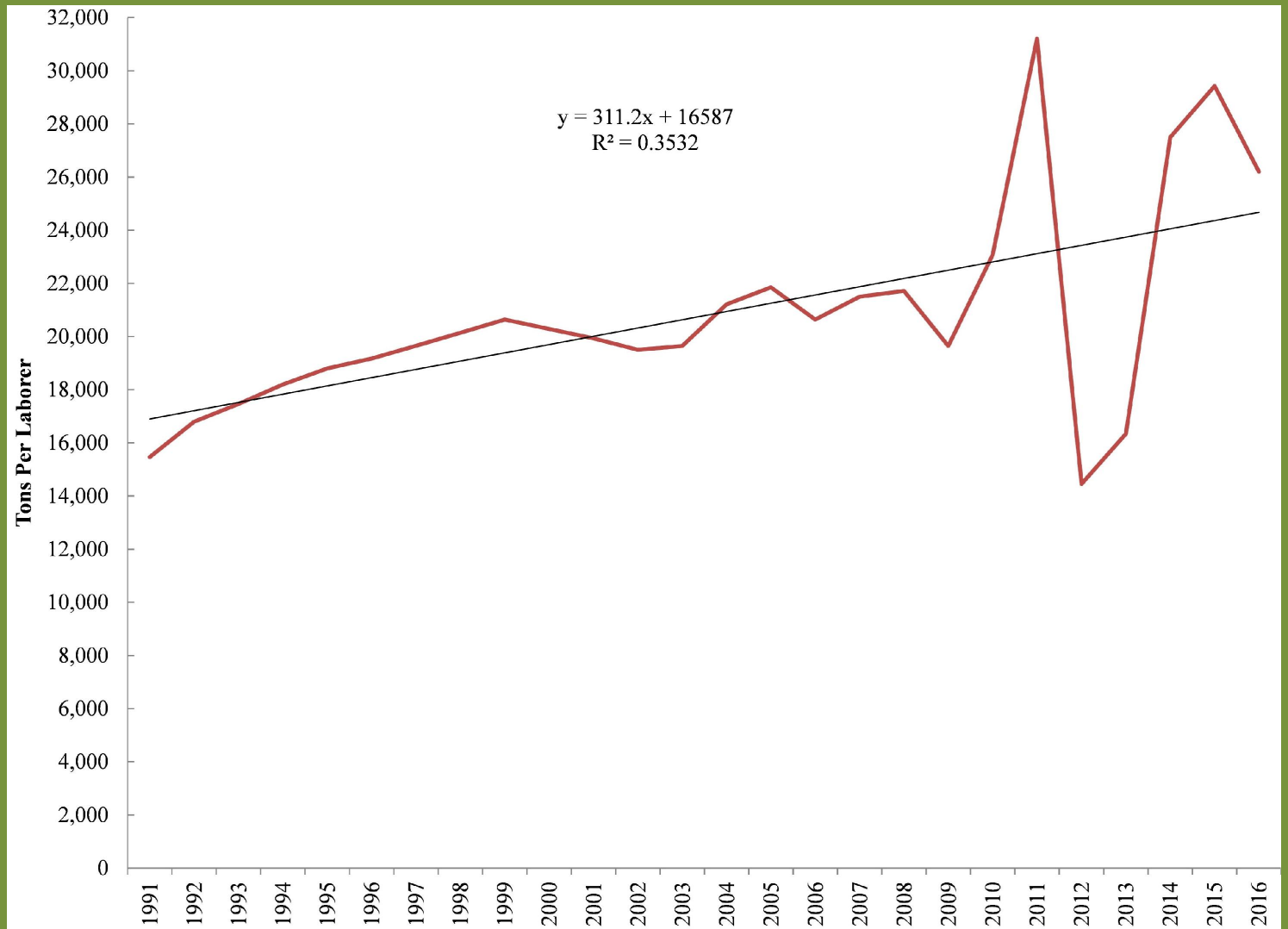
- Frac sand usage now rivals and might supersede previous major players
  - glass production, fine aggregate for mortar and concrete, bedding sand for dairy operations, road paving, and drinking water filtration
- Since late 90s silica demand has entered exponential – and heretofore undocumented – phase of growth curve (Note: TX Barnett up and running mid-90s)
  - 41% of historical production and 82% of gross revenue
    - **"Those who have sand or access to sand can pretty much charge what they want for that sand" EOG Resources CEO Park Papa**
  - ***Net consumption of Sand & Gravel sand is declining to the tune of -0.15% per year***, which means that theoretically somewhere in the US there exists various stocks equivalent to 80.68 million tons or the horizontal well equivalent of 8-14,000 laterals, wells assuming 6.0-5.0K tons of frac sand per well.

Silica Supply/Demand Economics



Struggle of Silica Sand Labor Vs Corporate Profits

- Industry has learned from their failures in the northern part of the frac sand region of Wisconsin and their amazing profits/productivity in places like LaSalle County, Illinois
  - Witness developments in Jackson County at the hands of Wisconsin Proppants and Hi-Crush
  - Bigger mines averaging >1,200 acres, more automation, closer to rail, etc



Factors Driving Mine Supply & Demand

- St. Peter & Wonewoc Formations in MN, WI, IA, IL, MO, AR, and OK
- Demand increasing by 192 tons per lateral Per Quarter (PQ) **(8-9% Per Year)**
  - 4.2-5.0K tons per lateral in OH (↑ from 230 tons in 2000); potential 15-20K tons in future
    - 3.3-3.5K tons per lateral in WV
- Laterals increasing by 50-55 ft Per Quarter
- Average mine proposal increasing
- Average Yield = 105-130K tons per acre
  - 27-33 Utica Laterals worth of sand per acre
  - 2.7-3.3K laterals worth of sand per mine

Variable	Avg	Increase Per Quarter
Lateral Length (ft)	6,440-6,380	+ 50-55 feet
Drill Cuttings (Tons)	608	4.7-5.2
Landfill Drilling Muds (Tons Per Facility)	28,098	15,319
Water Usage (Gallons)*		
OH**	6.2-7.0 MGs	405-410K
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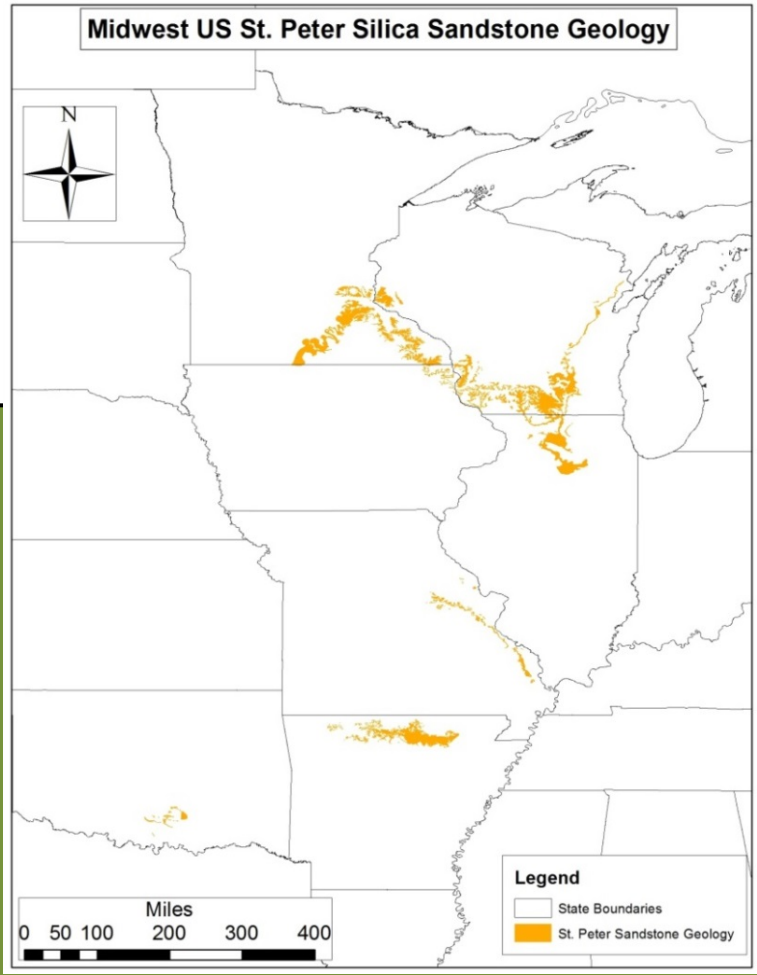


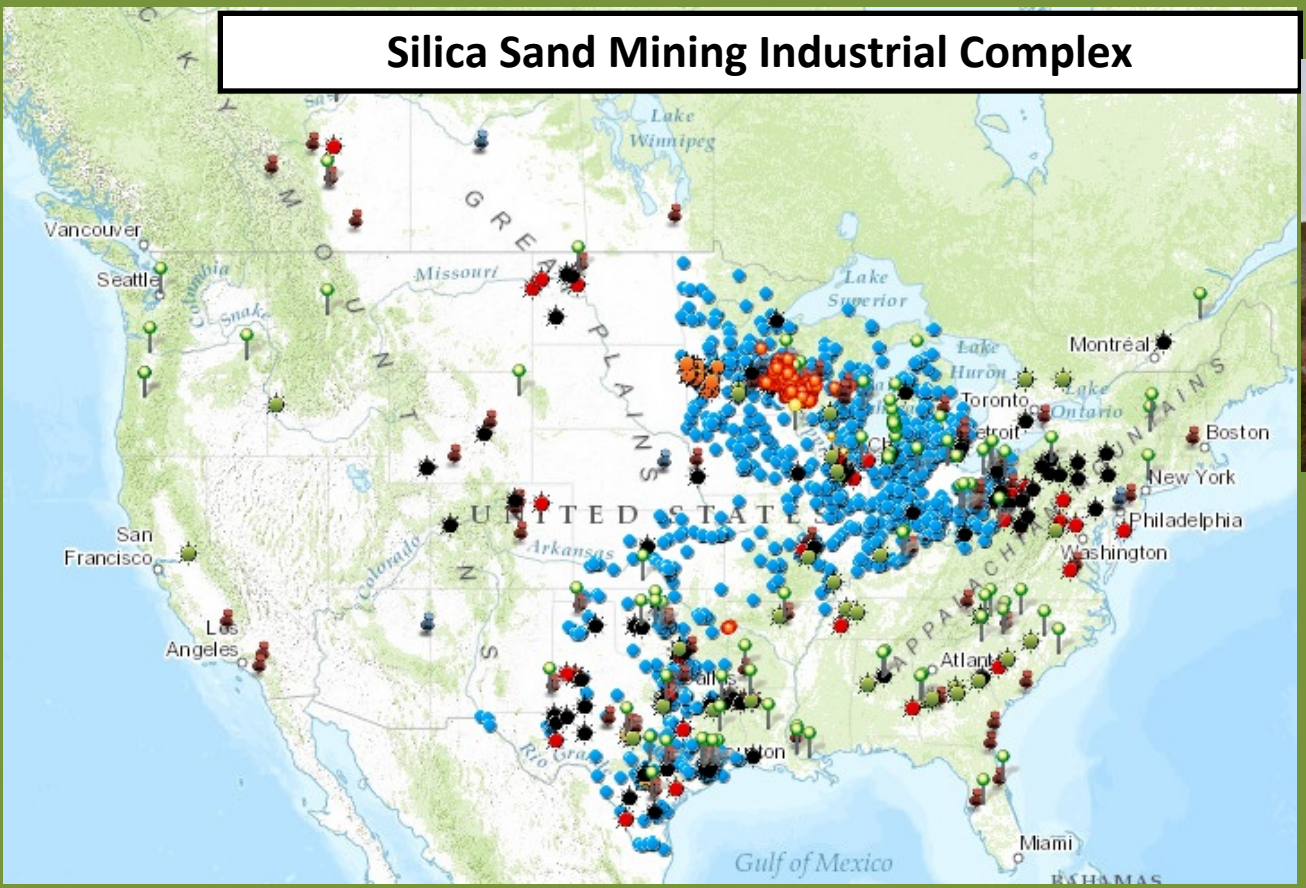
Difficulties Determining Stocks & Flows

- Actual production for each mine is unknown
  - Permitted production data is available for just 15-17% of known mines (129 mines in WI averaging 100-275 acres)
    - 60.1 million tons per year or 2.5 million tons per mine
      - Wisconsin producing roughly 211-336 million tons per year
      - 93.8-149.3K horizontal wells (11-18% of current US O&G inventory)
        - » Ohio laterals averaging 6,300-6,400 feet but getting longer to the tune of 3.1-3.7% per year

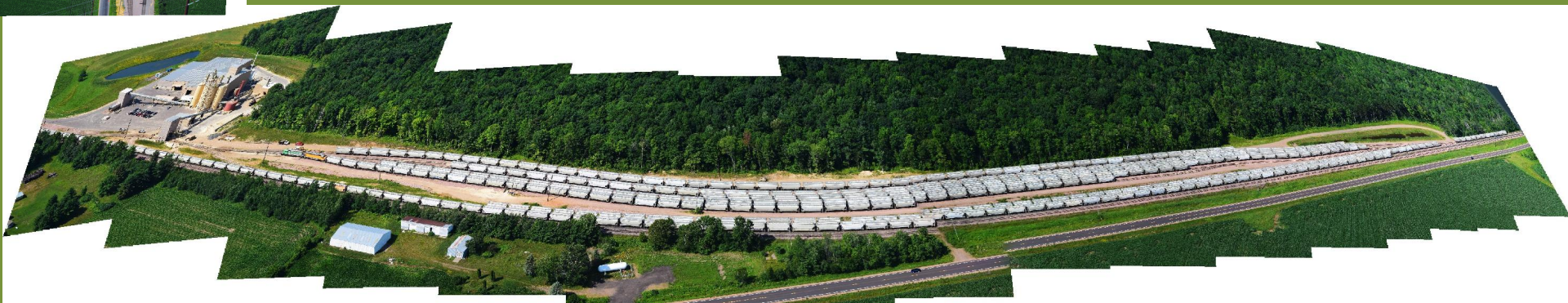
Difficulties Determining Stocks & Flows

- Barges, Trains, and Trucks
- Transload, intermodal, and resin coating facilities
  - Permanent/Temporary Road Closures

Silica Sand Mining Industrial Complex

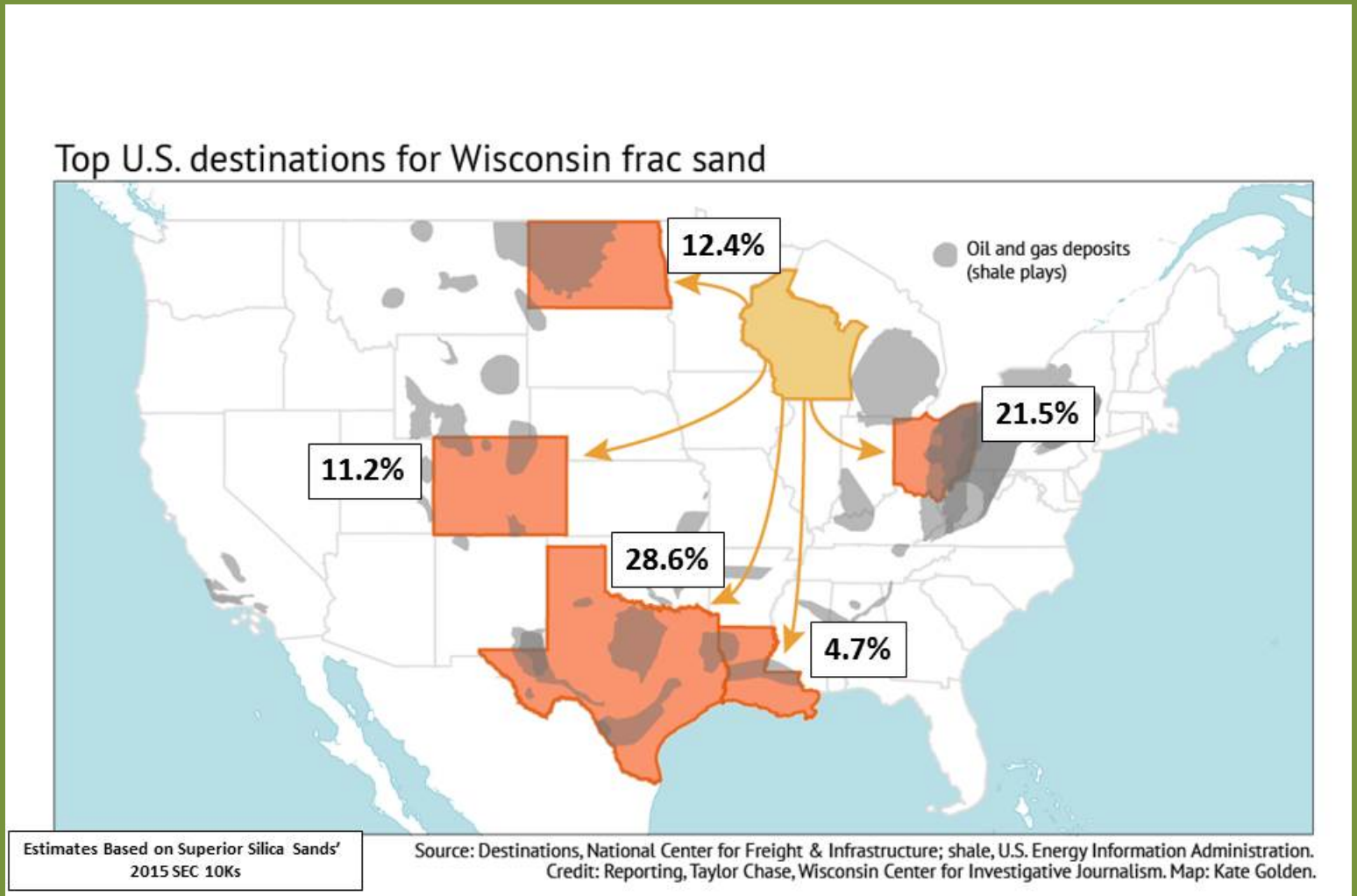


Frac Sand Rail in Western Wisconsin



Difficulties Determining Stocks & Flows

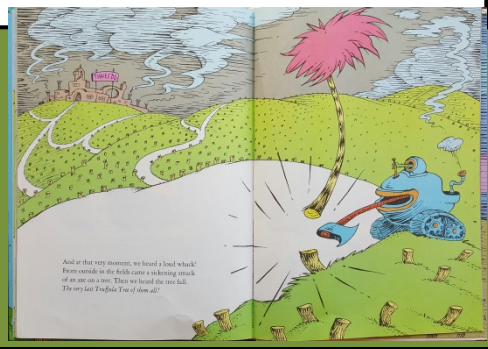
- Which plays is this stuff going to? At what rate? How is commodity transport being effected?



Sand Mining and the Human Condition in IL, WI, and MI

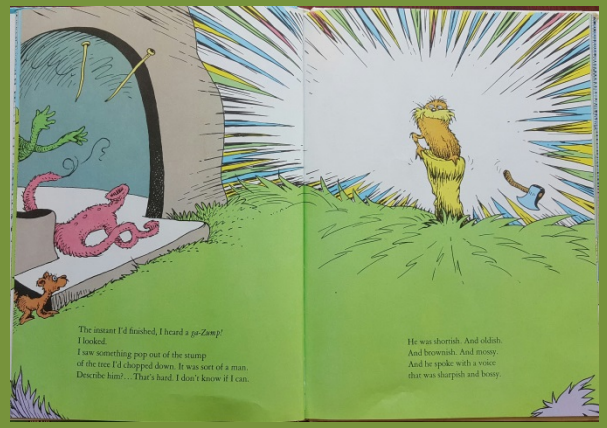
- **Residents concerns – EROEI, FEW, real-estate, landscape change, soil quality, etc**

"***today's mechanized farmer sees the hills as an impediment to "fence to fence" monoculture agriculture and looks on the sand mining as a way to get the hills pared down to a gentler slope so that he can use the machinery to plant more of the land to whatever row crop*** he is growing on the rest of the farm - not recognizing that the land that will be there after the mine will be nowhere near as fertile as the rest of the farm!"



"[Chippewa Co. Land Conservation agent] has indicated that the ***highest level that can be attained in the reclamation process is to convert it to land to be used for raising corn.*** Since there are no reclaimed areas in the county as a result of frac sand mining nor even in other counties, it is difficult to say what quality of land this will be as it is reclaimed. At best, corn may be grown.....***but with the addition of lots and lots of water plus fertilizers (nitrates)*** to allow for nutrition for growing of the crop. It may not be possible in many places to raise corn.

"The most difficult thing for the Frac-sand industry will be to reclaim mined properties to meet their end use...Most of the hills that are being mined have ***extremely shallow topsoil as well as limited sub-soil***... In addition due to the source of a large part of the materials-forested hillsides-it is expected to have a rather ***low ph, fertility issues, and poor moisture holding ability***. It is the opinion of many of us that the end result will be a ***very poor stand of grass with some woody plants of very poor quality and little value on the whole for wildlife***...In addition we fear that due to the loosely consolidated nature of the profile and nearness of the mine floor to the water table (3-5 feet in some cases) there will be a substantial risk of groundwater contamination from pesticides and fertilizers in these cases."



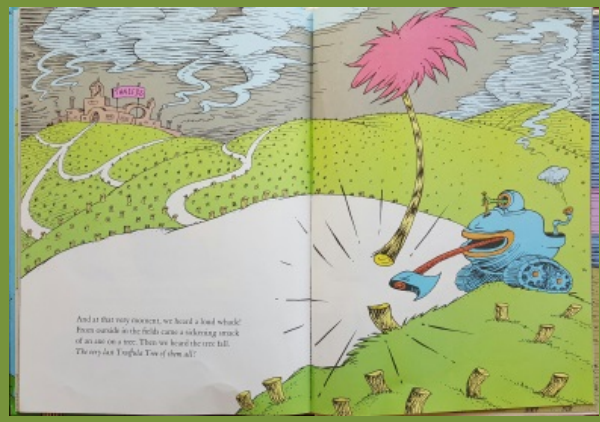
"Wedron Silica uses 100 million gallons of water per hour in sand processing...the mine has reversed the flow of the ground water...As a result of...well ...poison[ing] 23 acres of my land has been devalued by the county to $1.00...five buildings are worth 40% of what they were before nine wells were poisoned in Wedron."

Sand Mining and the Human Condition in IL, WI, and MI

- **Residents concerns – EROEI, FEW, real-estate, landscape change, soil quality, etc**

"***We toiled for years to green it up with trees and grass, a labor of love for our "place in the country". I mean, what's not to love about semi-truck traffic, air pollution, house tremors not to mention plummeting property values!*** Since South Rockwood village annexed the quarry in 2010, placing ***a quarry wall literally 300 feet from my home, we deal with noise of crushers, loaders, drilling for blasting, and blasting.*** All the while we are left to wonder what kind of garbage we are inhaling since there seems to be NO REGULATIONS, AIR MONITORING OR DUST CONTROL MEASURES AT ANY TIME!! ***And if that isn't enough, the village wants to relocate the freeway ramps to our road for the quarry's trucking convenience.***"

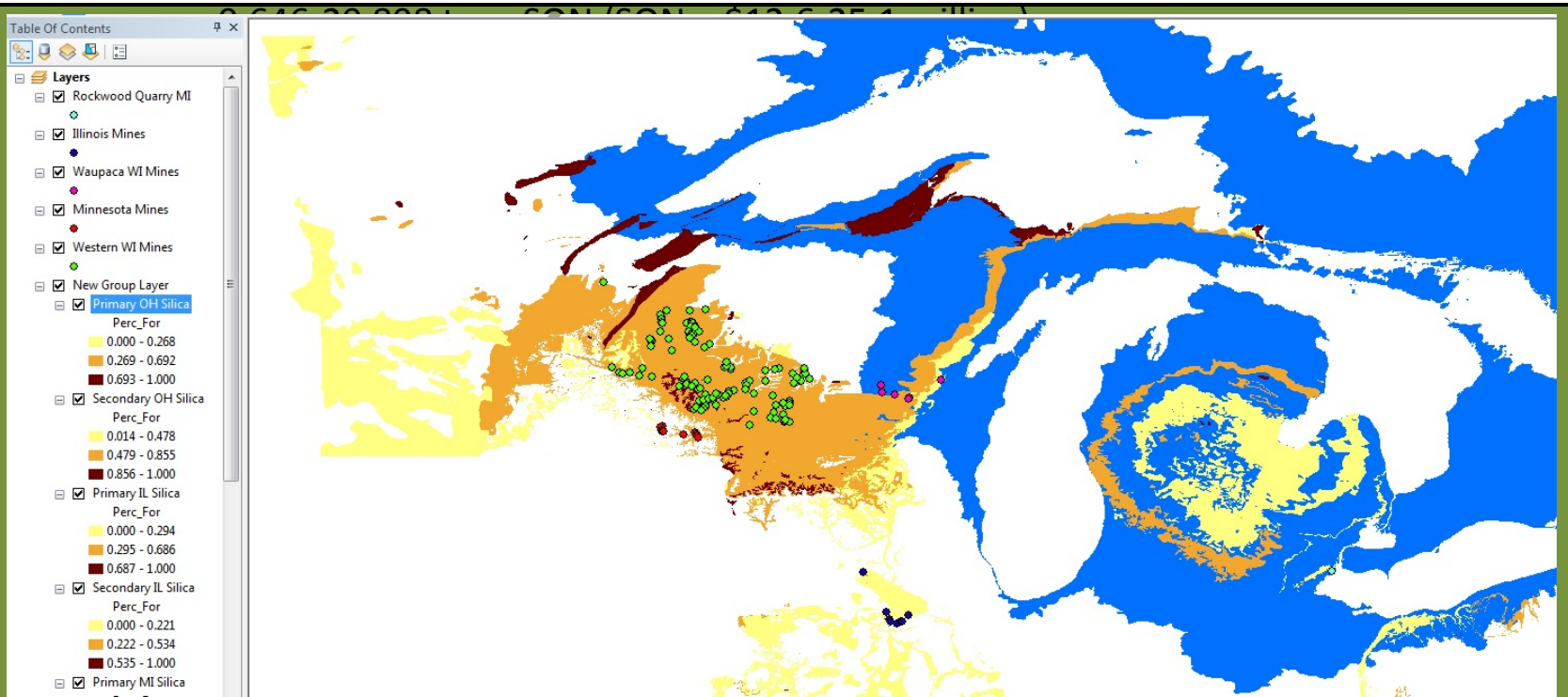
"***If Sargent completes their mining as projected over the next 30-40 years, the Ludington Dunes (about 40% of the Complex) will be 60-70% destroyed/mined/removed…Sargent has removed 10-15% of the Ludington Dunes, to date.*** Our property lies 1,200 feet from the Sargent operations at closest approach; ***aside from the unsustainable removal of the sands, the noise from Sargent's 24-7-365 operations is frequently intolerable.***"



"I really do "get it" in understanding that jobs are critically important for our State. Mouths are fed, bills are paid, colleges are attended. But the damage to Ludington left in Sargent Sands' wake when it is done here someday will be permanent scars from the removal of Sand Dunes so rare and so beautiful, that I'm certain that we will all regret what we allowed to happen while on "our watch". I believe that Ludington's precious Sand Dunes are not really "ours"…to destroy or allow to be taken. They are timeless natural resources that we have simply been granted stewardship over by our own forefathers and mothers...I ignorantly believed, at first, when Sargent Sands began mining sand again here that it would be something akin to raking one's yard of leaves. When I had an opportunity to hike their mining operation's perimeter, I witnessed what looks like strip-mining devastation. It's saddens me that I was complicit (when I myself purchased some sand for my backyard from Sargent's) but I am more frightened that our own DEQ (who should have known better) would have ever approved such disfiguring and permanent alteration to something so rarely seen in nature...*I ask our State, especially in light of Flint's man made devastation, PLEASE do not allow this to continue when Sargent Sands' permit expires in December of 2016. This sand mining destruction cannot be undone.*"

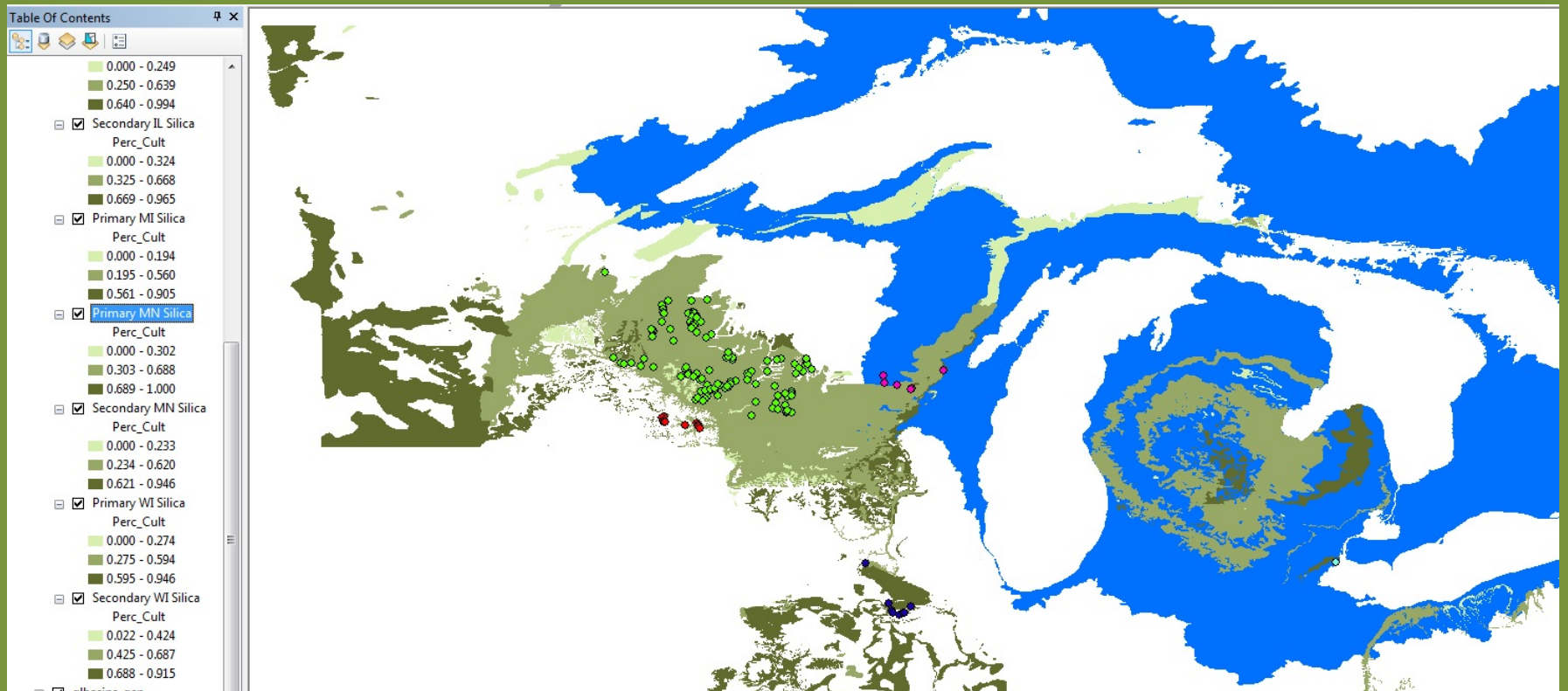
Land-Use Change & Watershed Integrity: ***Regional Scale***

- What we stand to lose
  - In WI 8,317 and 10,946 mi^2 of forest and cultivated land
    - Forests generate 12.4-24.1 million tons woody biomass per year + 11.0-23.8 MT foliage + 754,521-1,634,647 MT roots = 72-114 M m^2 basal area
      - Woody Biomass = $401-782 million value; 703,409-1.37 million per capita equivalents
    - 4.5-9.8 MT SOC ($677 million to $1.5 billion value)



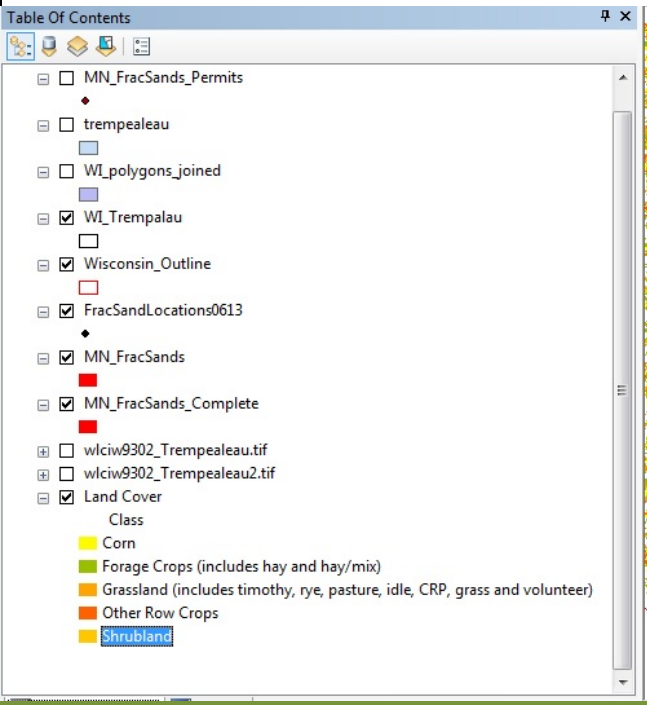
Land-Use Change & Watershed Integrity: ***Regional Scale***

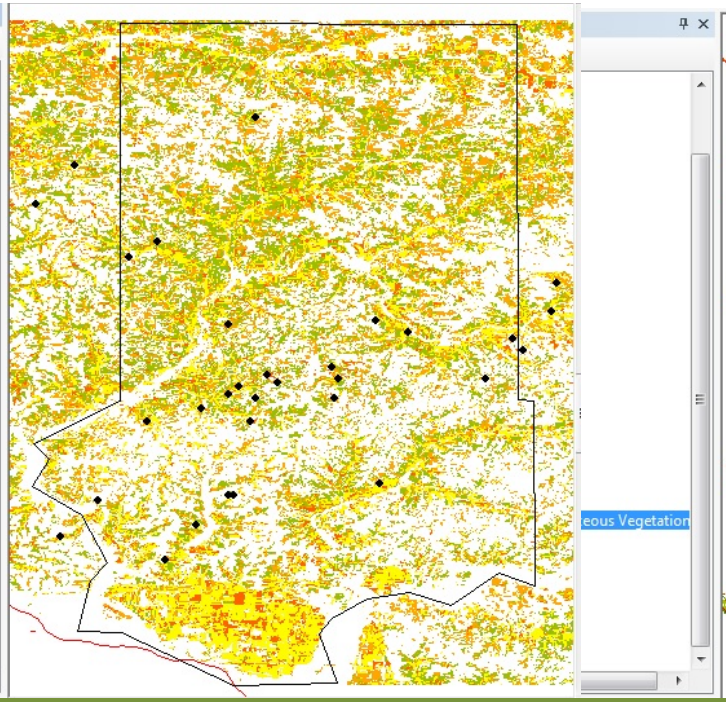
- What we stand to lose
  - In WI 8,317 and 10,946 mi^2 of forest and cultivated land
    - 27.8 million tons of crop biomass per year worth an estimated $4.9 billion
    - 101.8 MT CO_2 or per capita emissions of 5.8 million Americans
      - $1.5-5.1 billion CO_2 valuation
      - 60 MT of SOC (220 MT CO_2); 1 MT SON ($514 million to $1.2 billion dollar value)

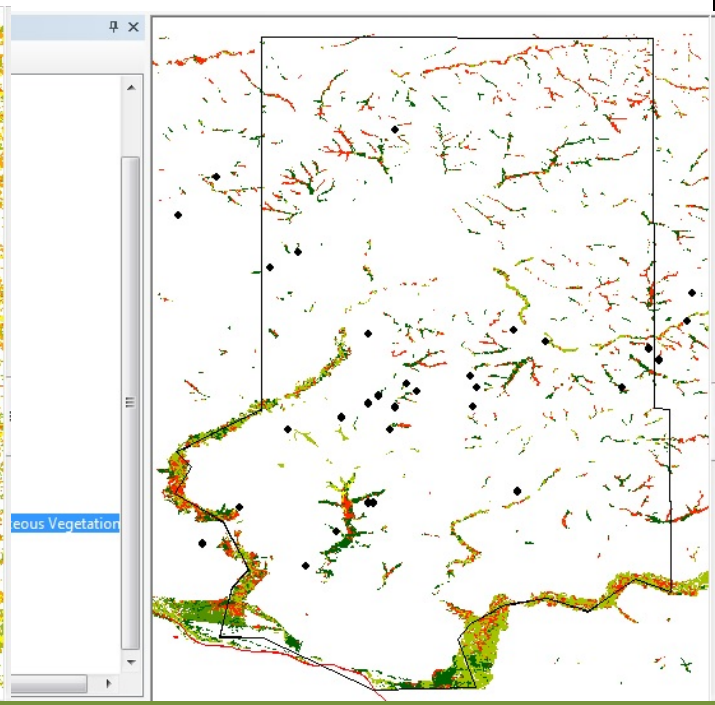


Land-Use Change & Watershed Integrity: *County Scale*

- Wisconsin County Case Study
  - 6% of county is forested
  - 781 of 1,705 square miles is agricultural (45.8%)
  - 1,265 of 72,136 total acres in frac sand mine production is in agriculture (1.8%)
    - Selectively picking off forested bluffs
    - Why? Because mining is sold as a way to lessen slope of forested fractions, making land available for production, generating leasing royalties, and revenue from timber sales

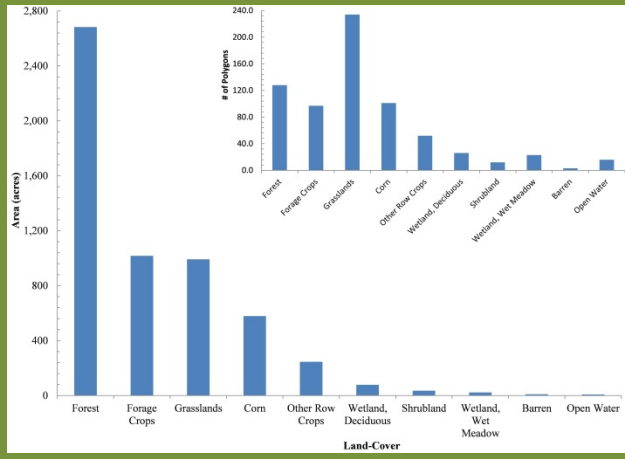


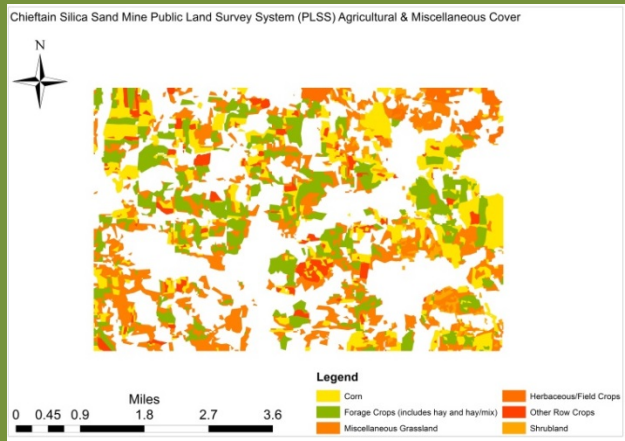




Land-Use Change & Watershed Integrity: *Mine Proposal Scale*

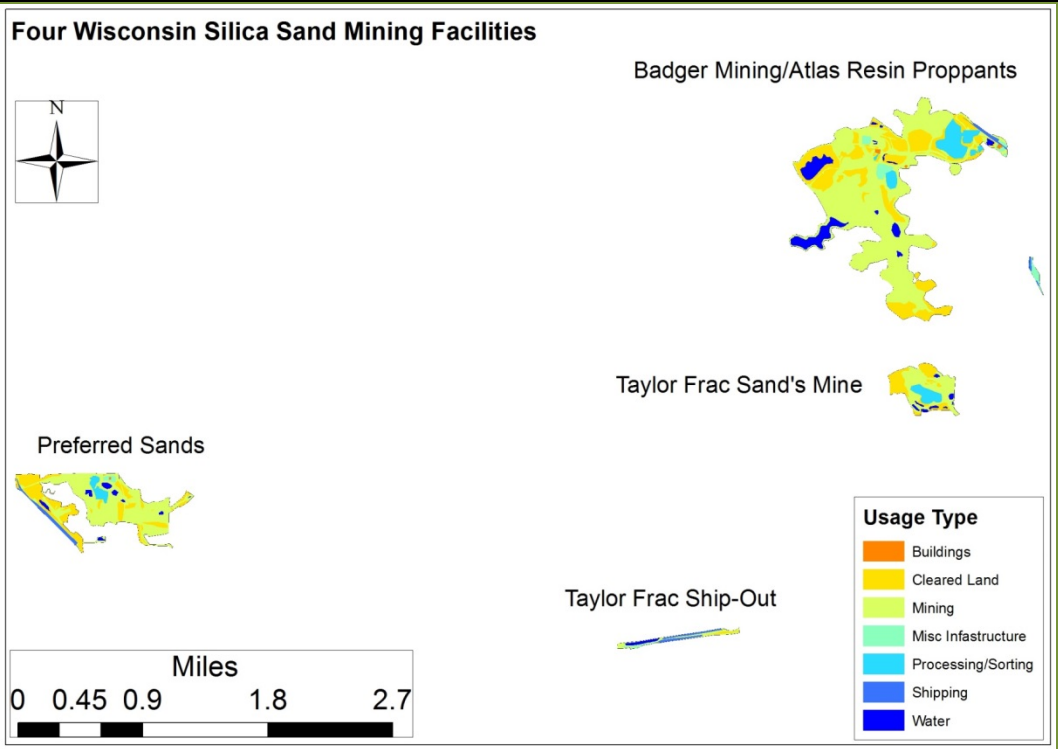
- **Chieftain Metals Corp Barron County proposal (9-12 mi^2)**
  - Currently 47% forest, 35% forage and grasslands, 15% crops, and 2% wetlands
  - Would remove 3.3-6.8 million tons of built up aboveground CO_2 or the per capita emissions of 202-416K Wisconsinites ($43-77M worth of soil fertility)
  - The CCS potential is currently valued at $1.490-6,334 per acre per year
- **Total value of ecosystem services = $8.8-16.6 million per year ($1,552-2,927 per acre per year)**
  - If converted to mines services generated would decline to $5.0-9.5 million





Land-Use Change & Watershed Integrity: *Existing Mine Scale*

- Methodology
  - delineated using 2013 aerial imagery from National Agriculture Imagery Program.
  - Data from the 2006 National Land Cover Database used to determine land cover within parcels prior to mining to compare with 2013 land-use.
  - SSURGO database was used to calculate soil carbon and nitrogen loss.
  - National Agricultural Statistics Service Cropland Data Layer was used to calculate different crop acreages within each parcel prior to mining. Dollar estimates were calculated from 2006 through 2013 using the Wisconsin Agricultural Statistics Report.



Land-Use Change & Watershed Integrity: *Existing Mine Scale*

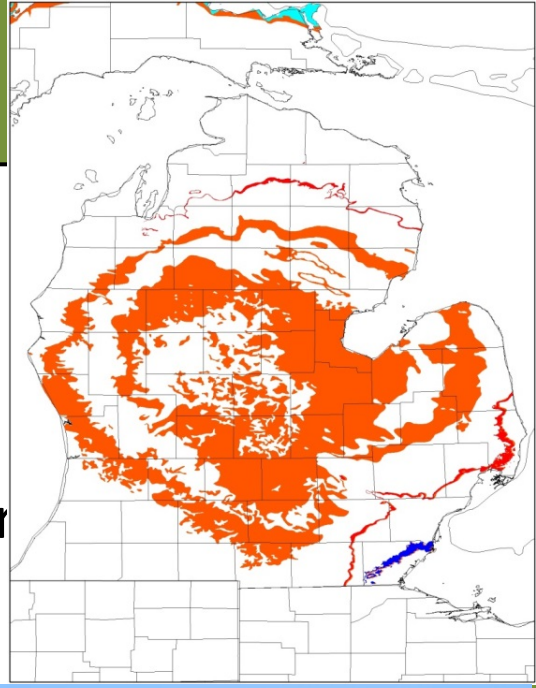
- Wisconsin's Current inventory of 78 silica mines
  - 1,130 acres of forest and 3,710 acres of cropland were displaced
  - 130 and 6K tons of soil carbon and nitrogen, respectively (i.e., $6.0-7.2K per acre)
    - Crop losses amount to $2.1K per acre or $98K per farm
    - 450K tons of forest productivity with a stumpage value of $176-275K
    - $75-176K in lost nitrogen or $66-154 per acre

Table 1: *Land cover change between 2006 (Columns) and 2013 (Rows). Read each cell as the amount of land of type 'column' replaced by type 'row' in 2013 (Acres).*

	Water	Developed	Barren	Deciduous	Evergreen	Mixed Forest	Shrubland	Herbaceous	Farmed	Wetland	Total Area
Buildings		22.73	1.65	4.01	1.33			1.46	30.73	0.25	61.83
Cleared Land	9.36	81.57	39.04	260.46	8.88	5.81	23.75	51.77	753.91	38.25	1273.43
Mining	22.68	146.43	244.63	689.54	54.26	8.45	58.49	79.62	2082.28	38.25	3424.65
Misc Infrastructure		7.75	4.67	5.67	1.11		0.44	0.67	73.04	2.89	96.07
Processing/Sorting		11.12	70.50	23.35	3.34		1.33	0.89	259.57	4.23	374.29
Shipping	1.11	35.81	0.67	9.34	1.78		1.11	19.62	111.98	8.23	189.48
Water	129.28	5.68	81.42	46.77	3.69	4.45	1.17	9.04	402.39	22.80	706.32
Total Area	162.44	311.09	442.59	1039.14	74.40	18.71	86.31	163.07	3713.90	114.90	6126.08

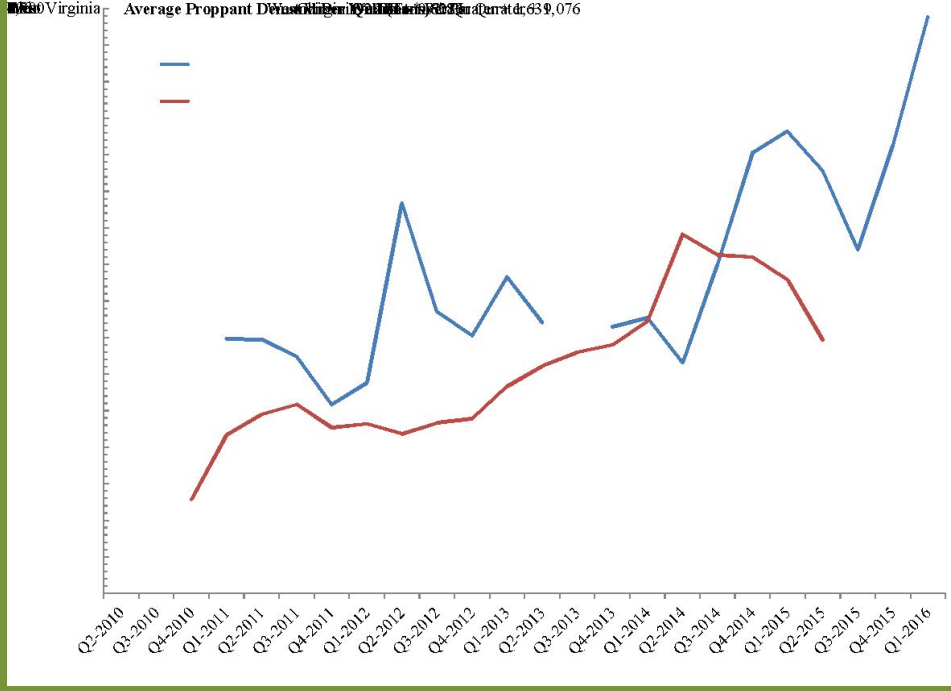
Future Concerns & Extent

- The Sylvanian Sandstone etc.
  - Proximity to Marcellus and Utica, Purity, Close to the surface
- Air & H2O quality, quantity, and discharge, landscape change, overburden mgmt., and aquifer contamination
  - 4.5-fold increases in production relative to traditional Sand & Gravel operatons
  - 80 to >300 Gallons of Water Per Ton of Silica



Water & Waste

- Silica Sand Mining and Water
  - 3-4K gallons H_20 per 1 ton of sand
  - Additional 13-17 MGs of freshwater per lateral bringing the grand total water demand to 22-29 MGs per lateral
    - Water ↑ 16-25% PYPL
    - Lateral Length ↑ 3.1-3.7% PYPL
    - **Proppant Demand ↑ 16-20% PYPL**



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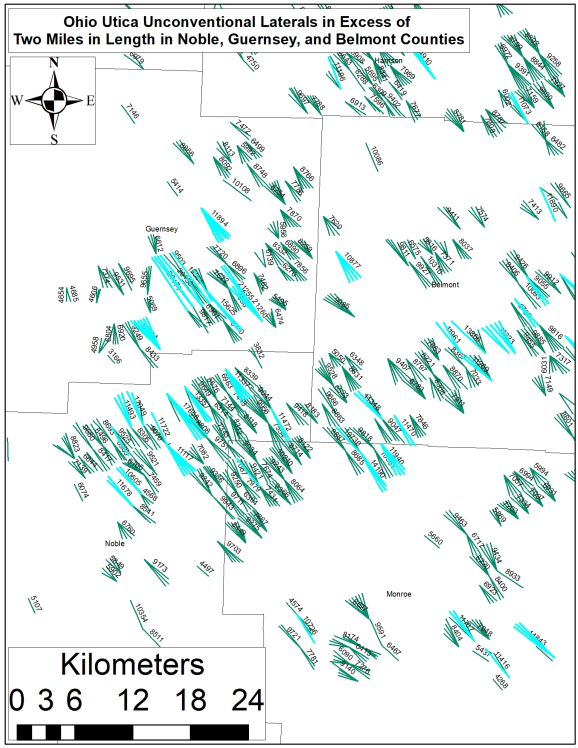
Purple Hayes, Outlaw & Walleye *Super* Laterals, Noble County, Ohio

- Roughly 4,470 GPLF Vs Ohio average of 970-1,080 GPLF
- Traditional lateral roughly 7,452 feet Vs these Super Laterals at 17-20K feet
  - Industry way outpacing existing 7-12% PY trend

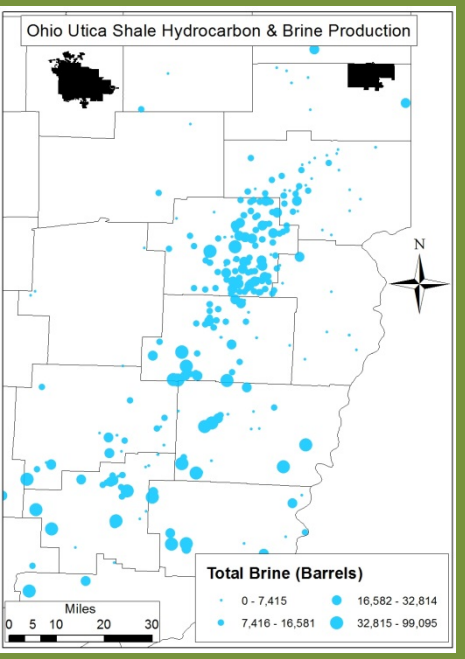


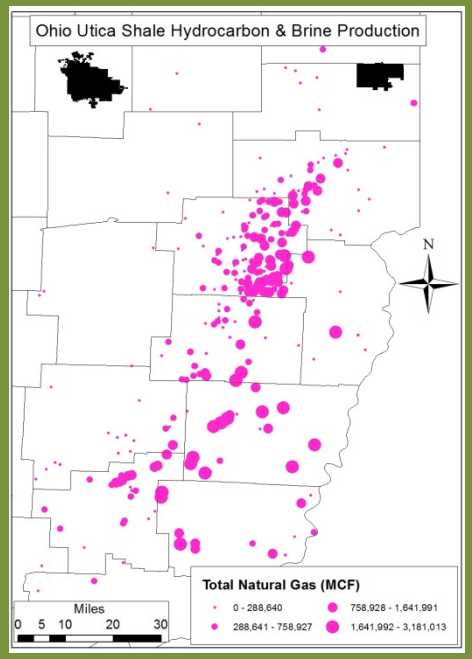
- As much as 87 MGs of Freshwater Per Well
  - Potential for > 12,200 Waste Truck Trips
  - ***10.3 MGs of Waste***

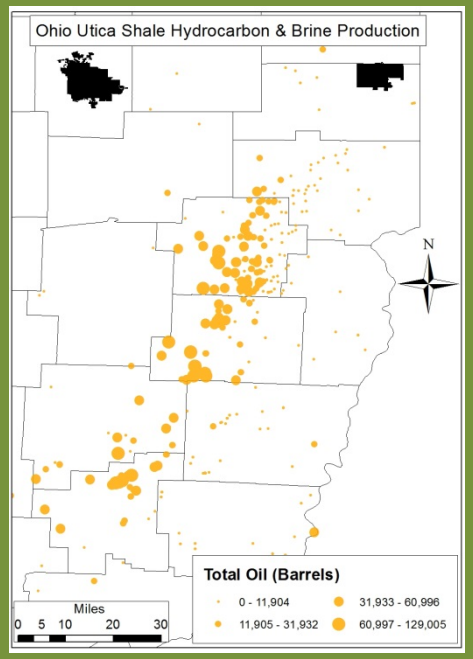
Palmer, Short, and Auch 2018 "The Human Right to Water and Unconventional Energy" Int. J. Environ. Res. Public Health 15(9), 1858

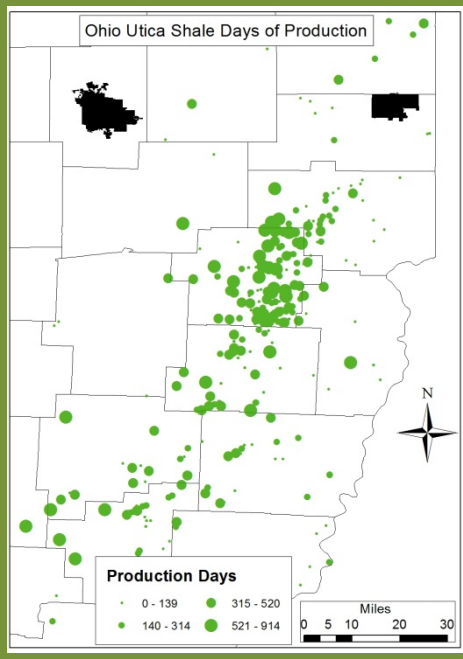
Silica Sand and O&G Production

- As laterals get longer (i.e., 50-55 feet per lateral per quarter) water, sand, and chemical needs expand in parallel
  - Total Production Increasing But Per Well Production Decreasing









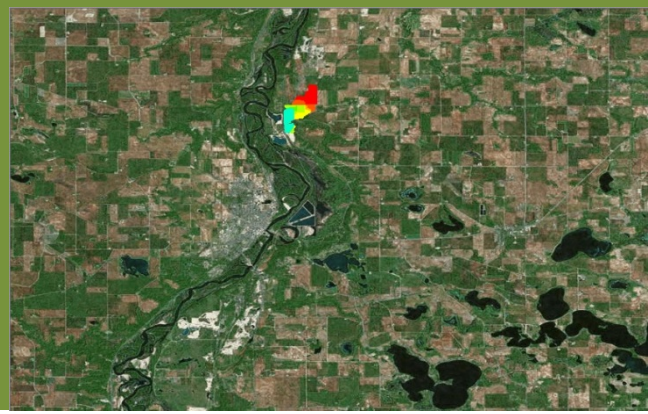
- 1st to 2nd Year Declines of 84% on a per day basis
  - Followed by 27% declines for oil and 10% for gas
    - Freshwater usage is increasing by 3.6 gallons of water per gallon of oil
- 2011 Vs Present
  - Oil – 2011 declines by 2.63 BPD Vs Present 21-48 BPD
  - Nat Gas – 2011 declines by 118 MCF Vs Present 125-251 MCF (Note: 2011 wells 3,158)

Sand Mine Rate of Change Past, Present, and ***Future***

- Unimin, Ottawa, MN

April 2015
- 561 acres

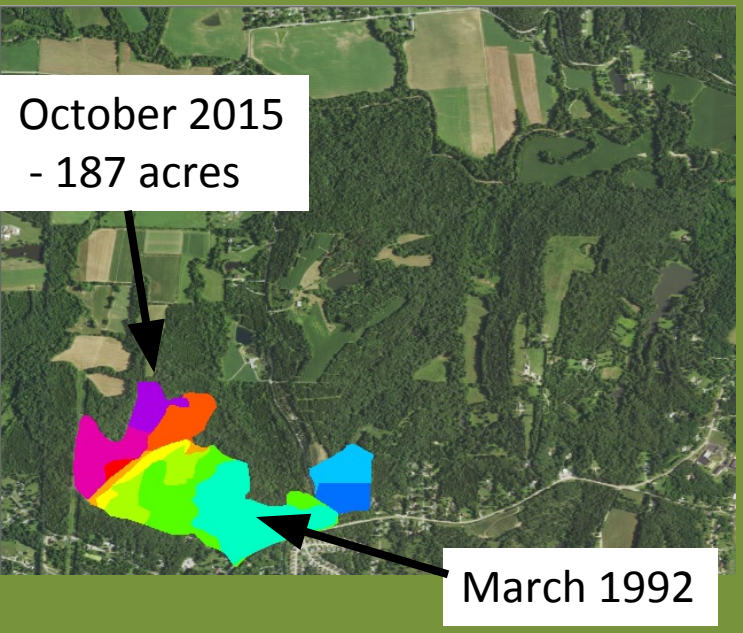
September 2003

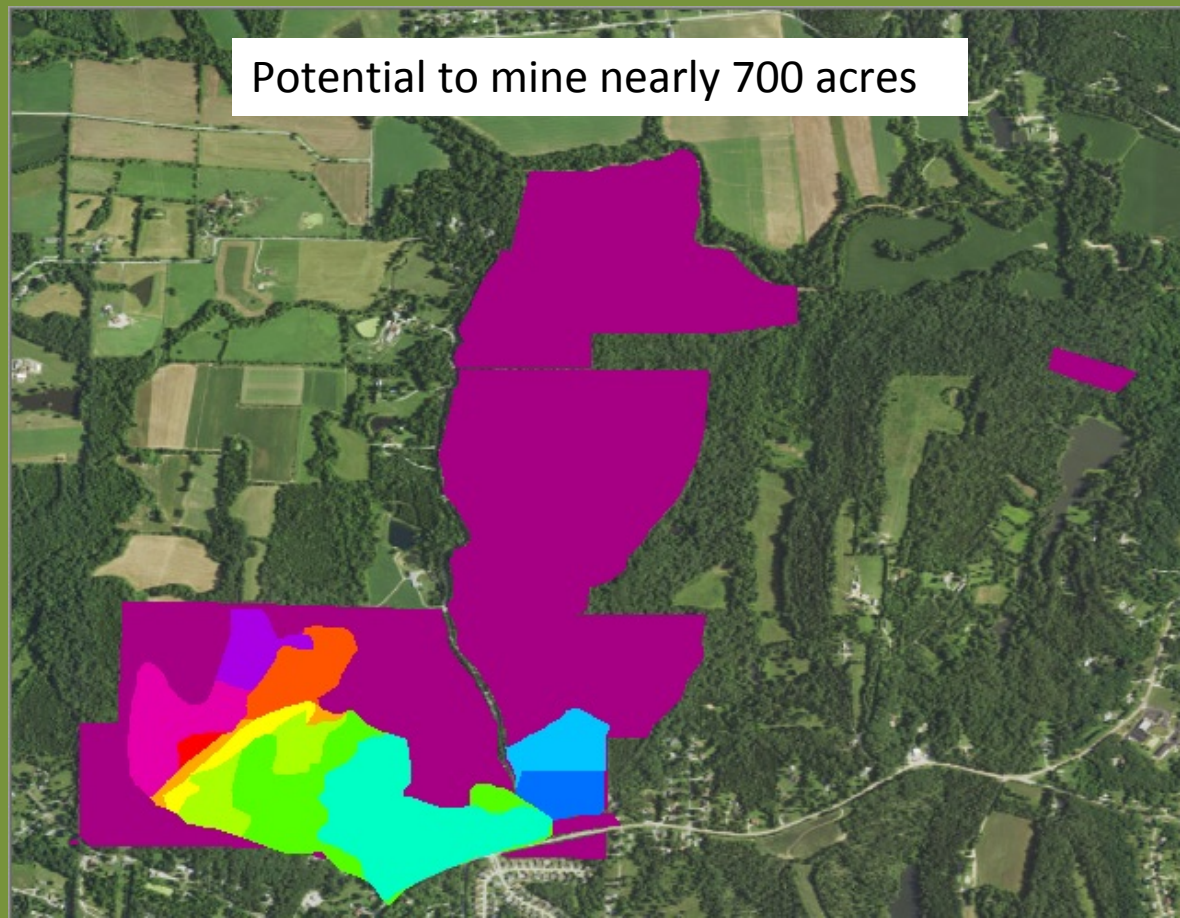


Potential to mine nearly 6,500 acres

Sand Mine Rate of Change Past, Present, and ***Future***

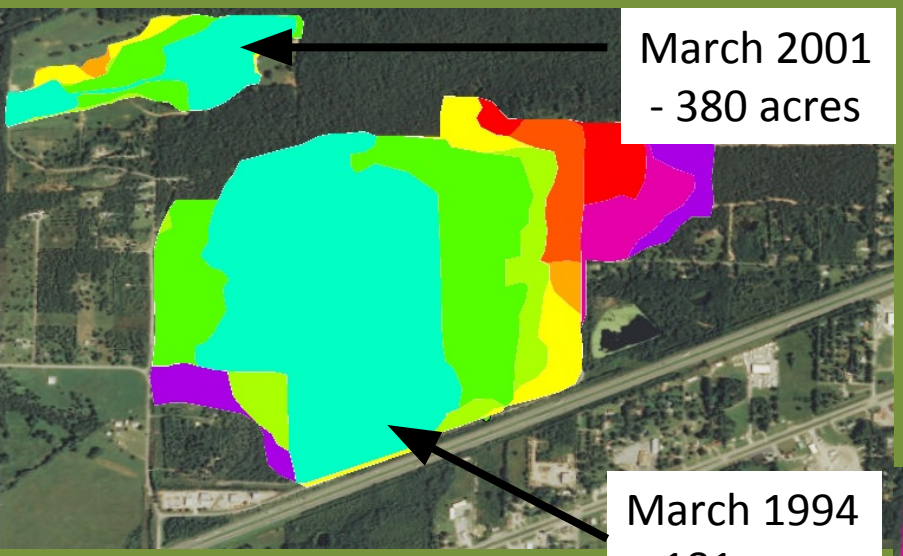
- Unimin, Peveley, MO





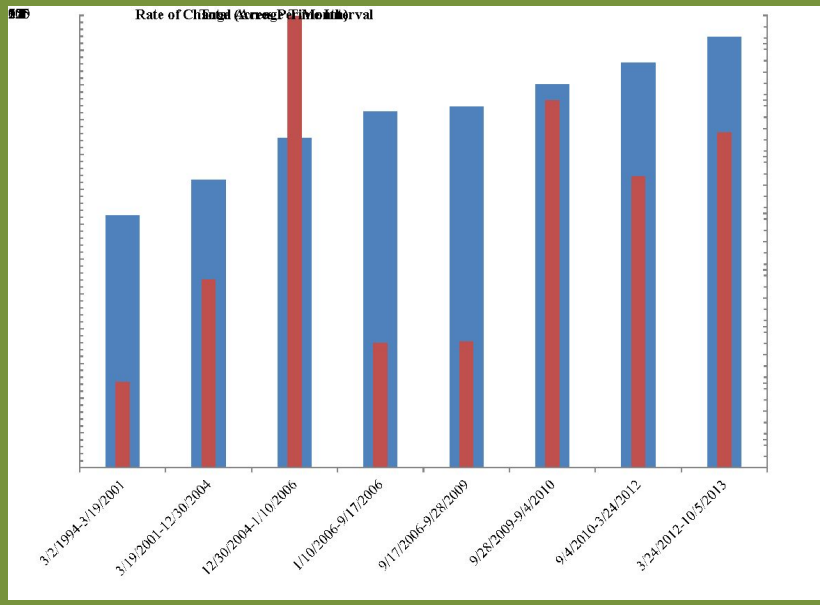
Sand Mine Rate of Change Past, Present, and ***Future***

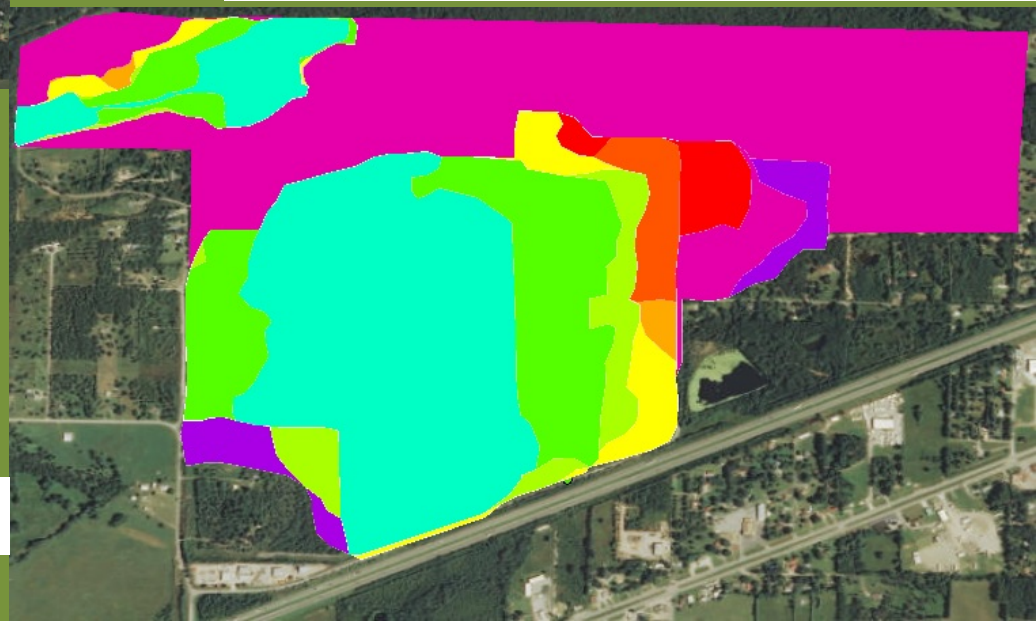
- Arkola S & G, Van Buren, AR



March 2001
- 380 acres

March 1994
- 181 acres

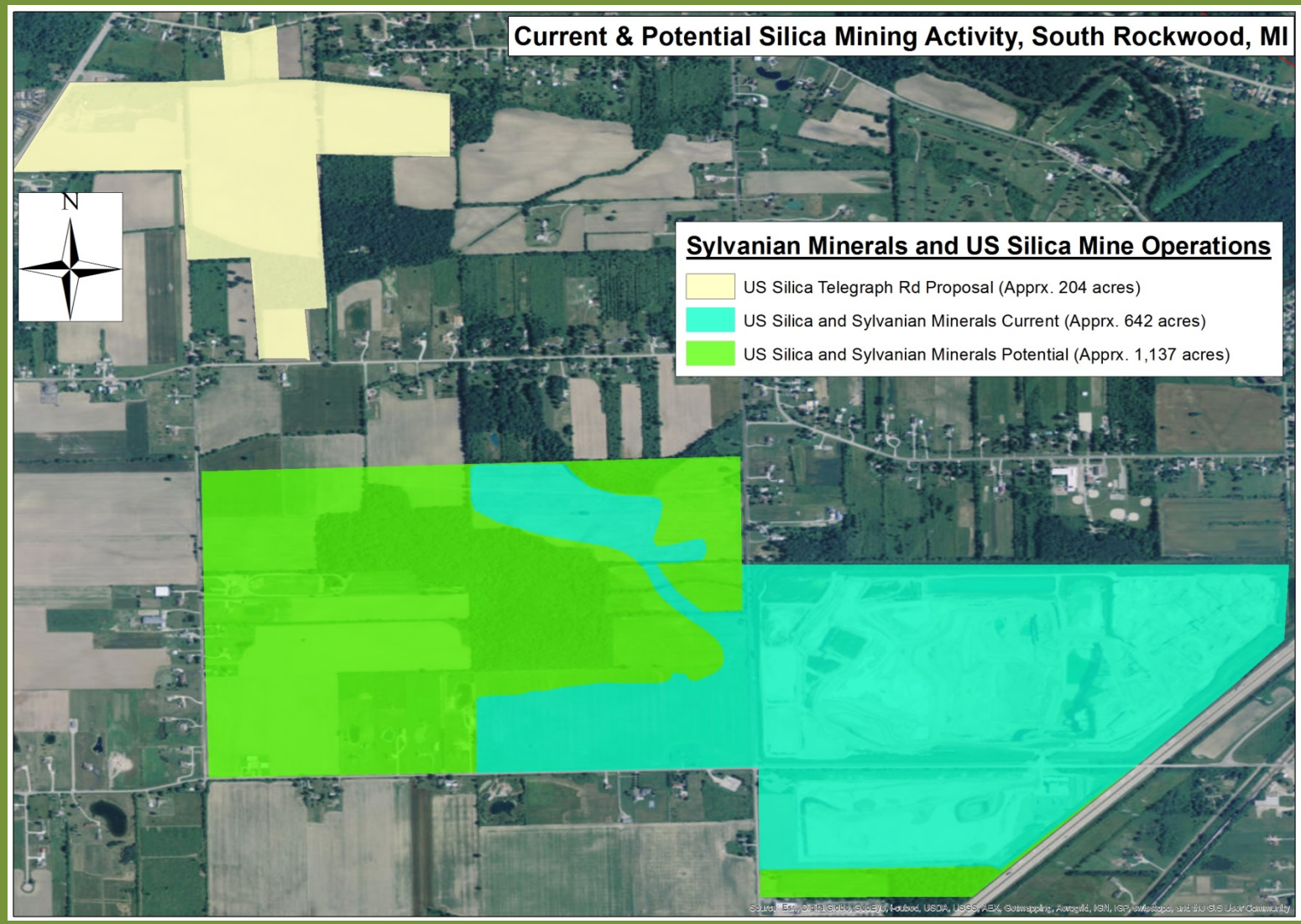




Potential to mine nearly 750+ acres

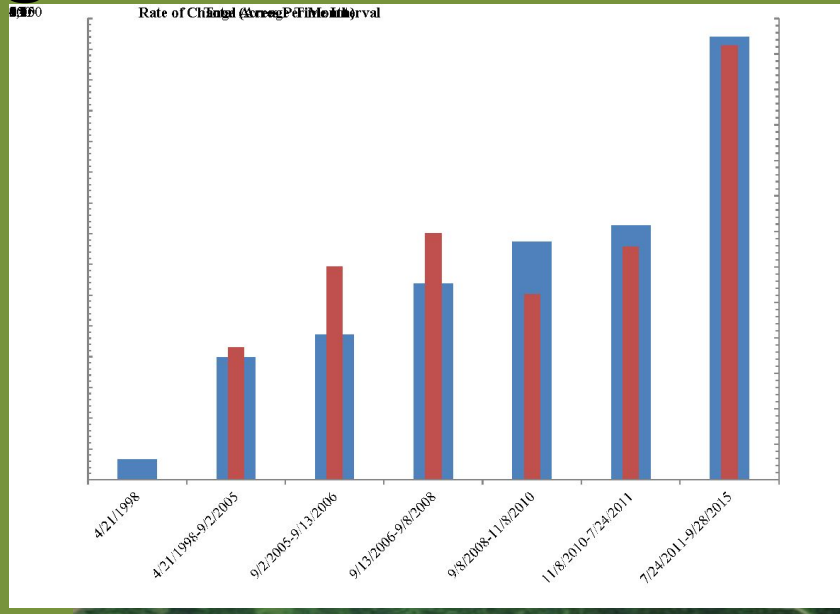
Sand Mine Rate of Change Past, Present, and ***Future***

- Sylvanian Minerals, South Rockwood, MI

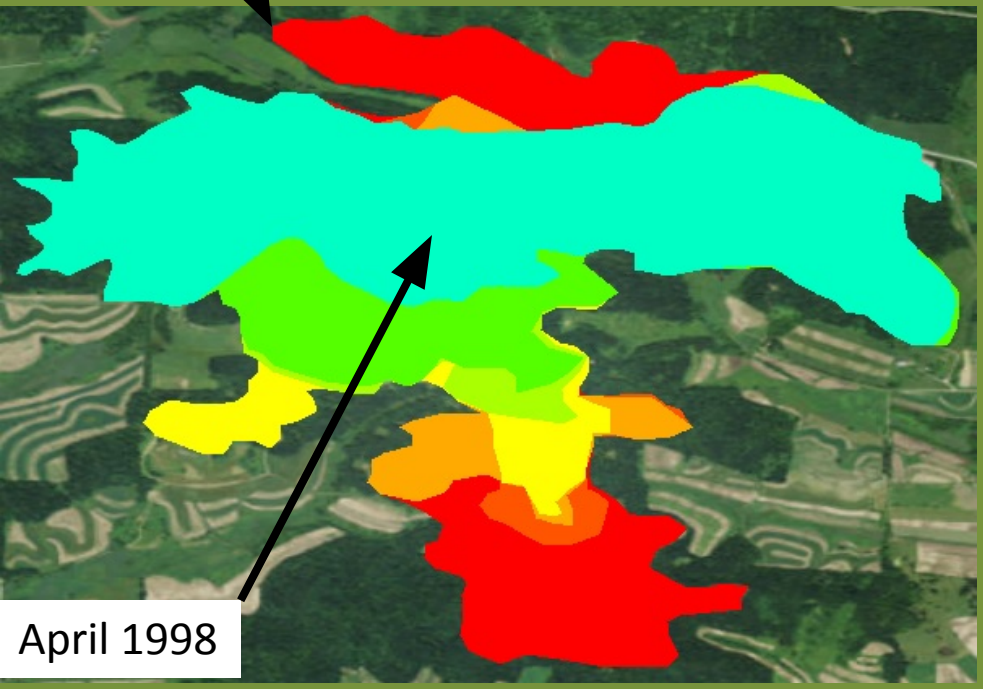


Sand Mine Rate of Change Past & Present

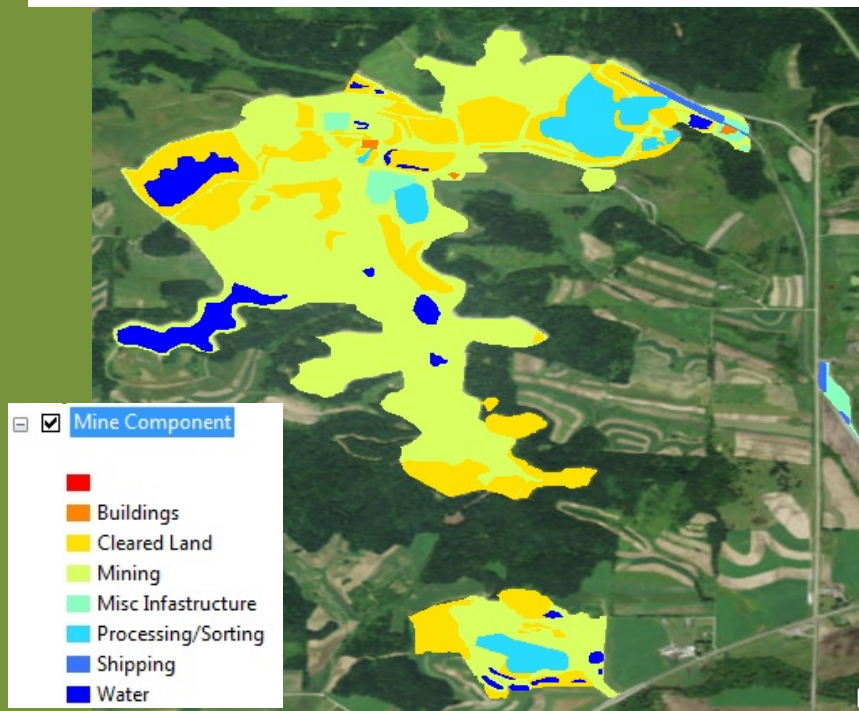
- Badger/Atlas Resin Mine, State Highway 95, Springfield
  - 2.7 acres per month 1998-2010
  - 5.0 acres per month Since



September 2015

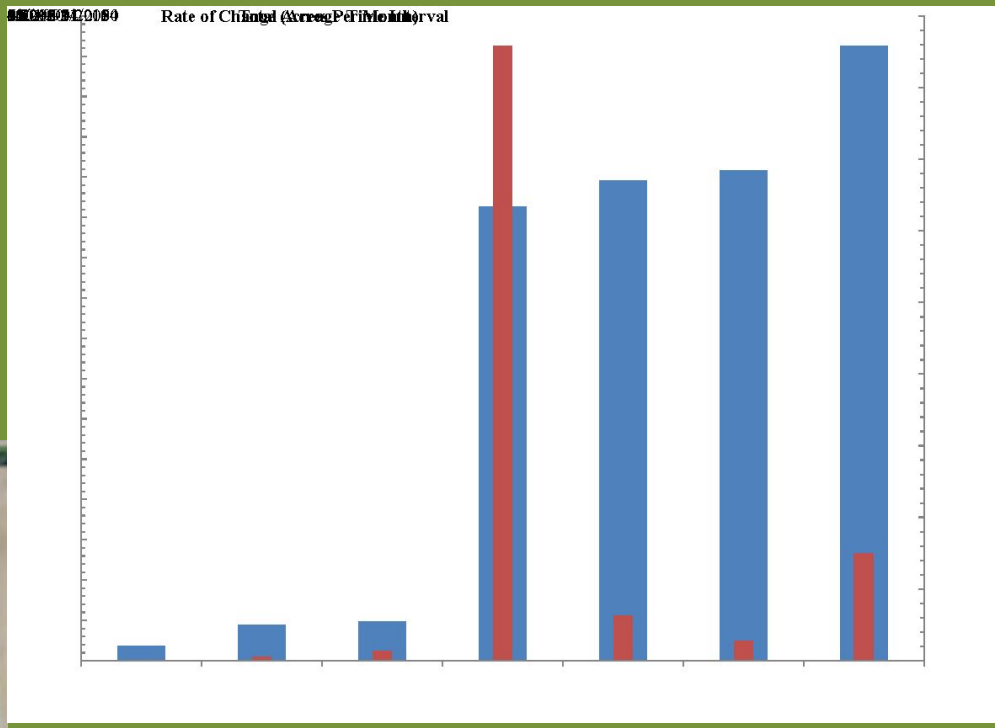


April 1998



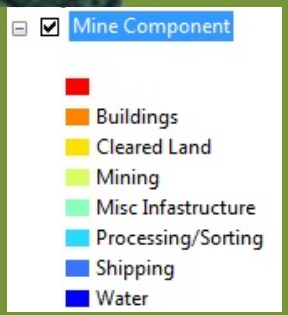
Sand Mine Rate of Change Past & Present

- Fairmount's Taylor Plant, 580th Street, Menomonie
  - 0.3 acres per month 1992-2011
  - 4.2 acres per month Since



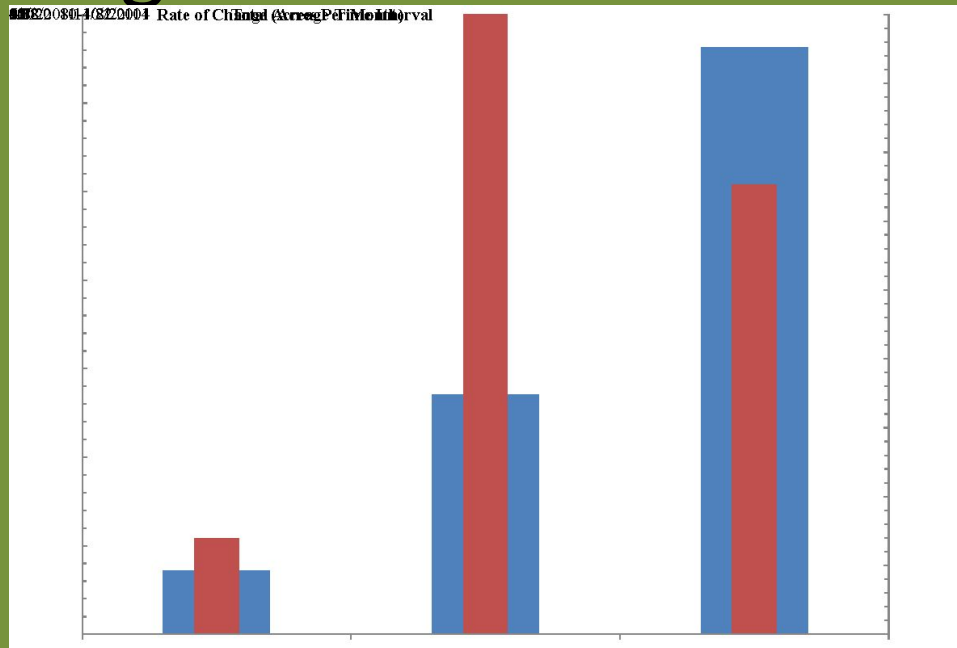
April 2014

May 1992

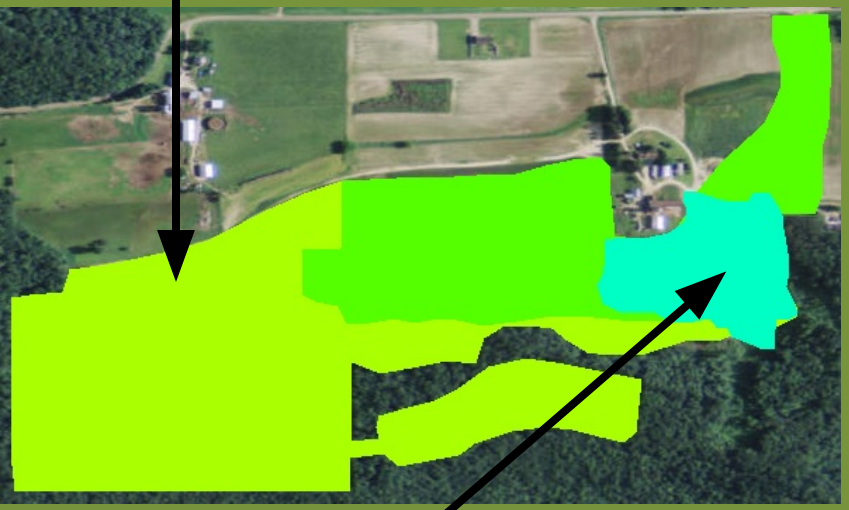


Sand Mine Rate of Change Past & Present

- Preferred Sands Lagesse Mine, Cooks Valley
  - 0.6 acres per month 2008-2010
  - 3.2 acres per month Since



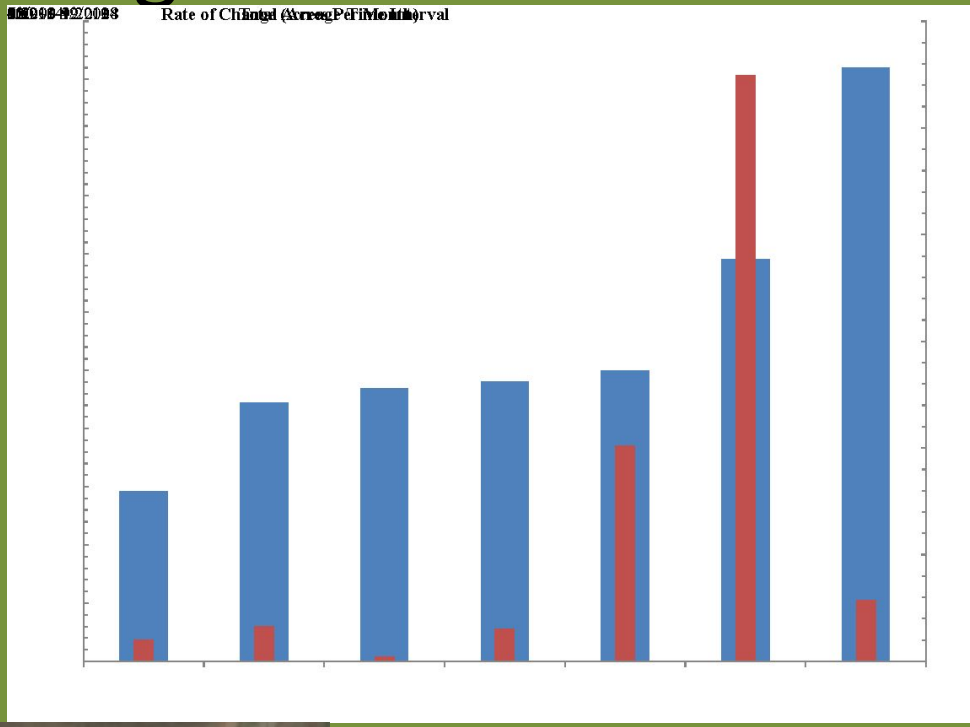
April 2014

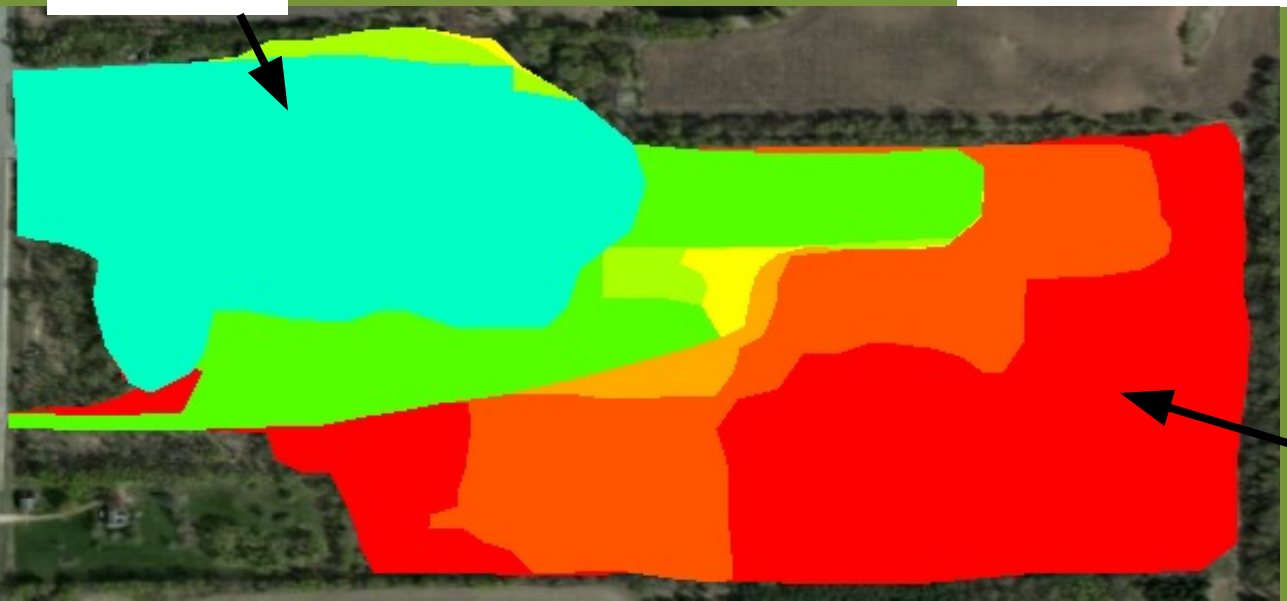


August 2010

Sand Mine Rate of Change Past & Present

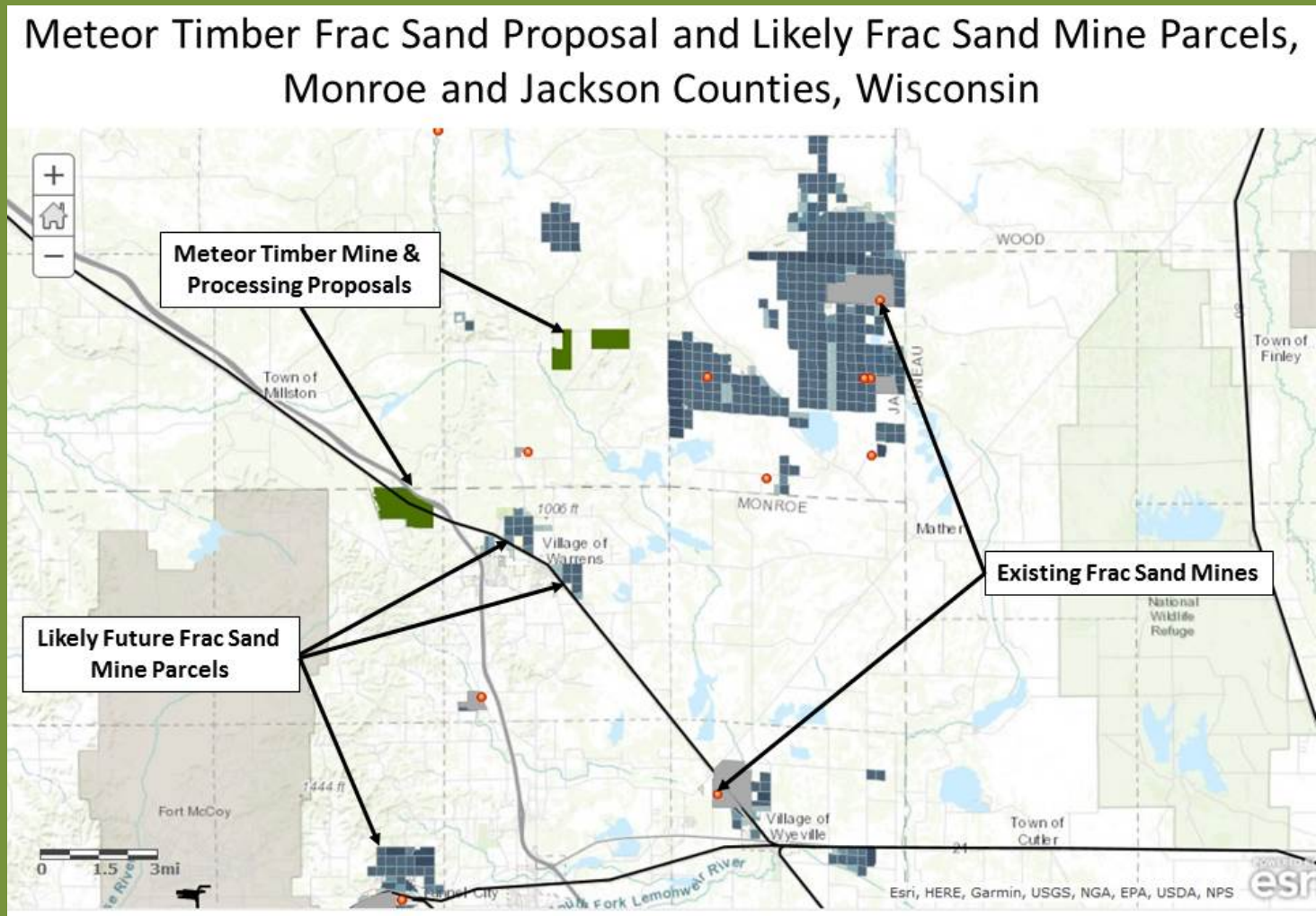
- Preferred Sands, Woodbury, MN 19 miles east of downtown Minneapolis
  - 0.11 acres 1991-2009
  - 1.4 acres Since





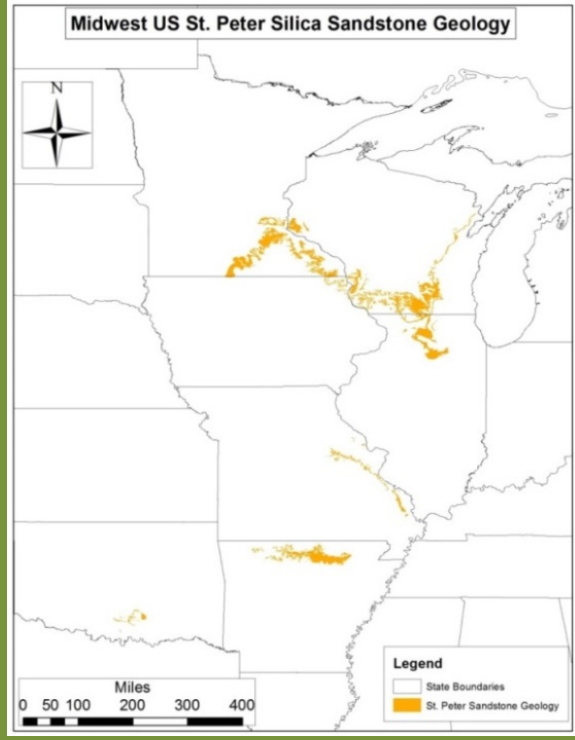
Sand Mine Rate of Change Past, Present, and ***Future***

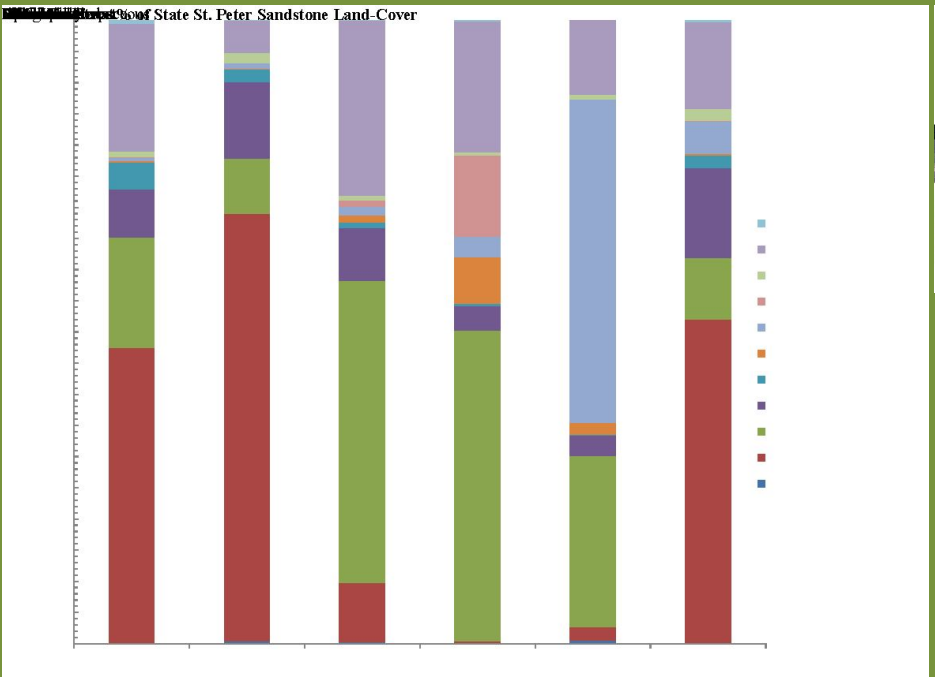
- Meteor Timber, Monroe and Jackson Counties, WI



Future Concerns & Extent

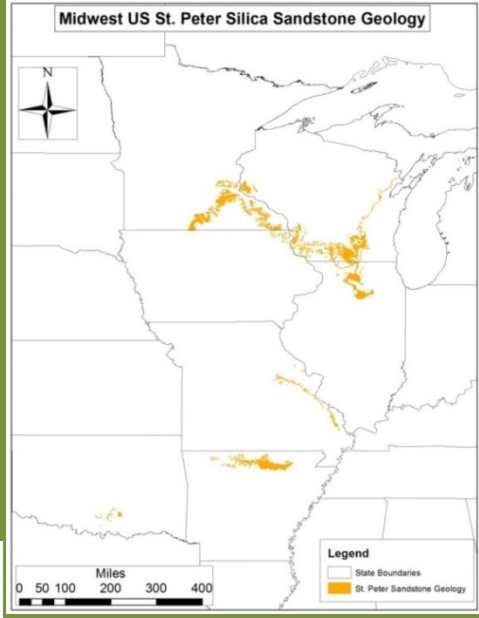
- **The St. Peter Sandstone (SPS)**
- **8,863 mi^2 across seven states**
- 3.6K mi^2 Crops, 2.3K mi^2 Forest, 1.5K mi^2 pasture, 335 mi^2 of Grasslands, & 204 mi^2 of wetlands
  - ***Crop*** concerns in MN, IA, IL, and WI
  - ***Forestry/Wildlife*** in MO, AR, and OK
  - ***Pasture/Hay*** across 6 of 7 SPS states
  - ***Wetlands*** secondary or tertiary concern in WI, MN, and IA

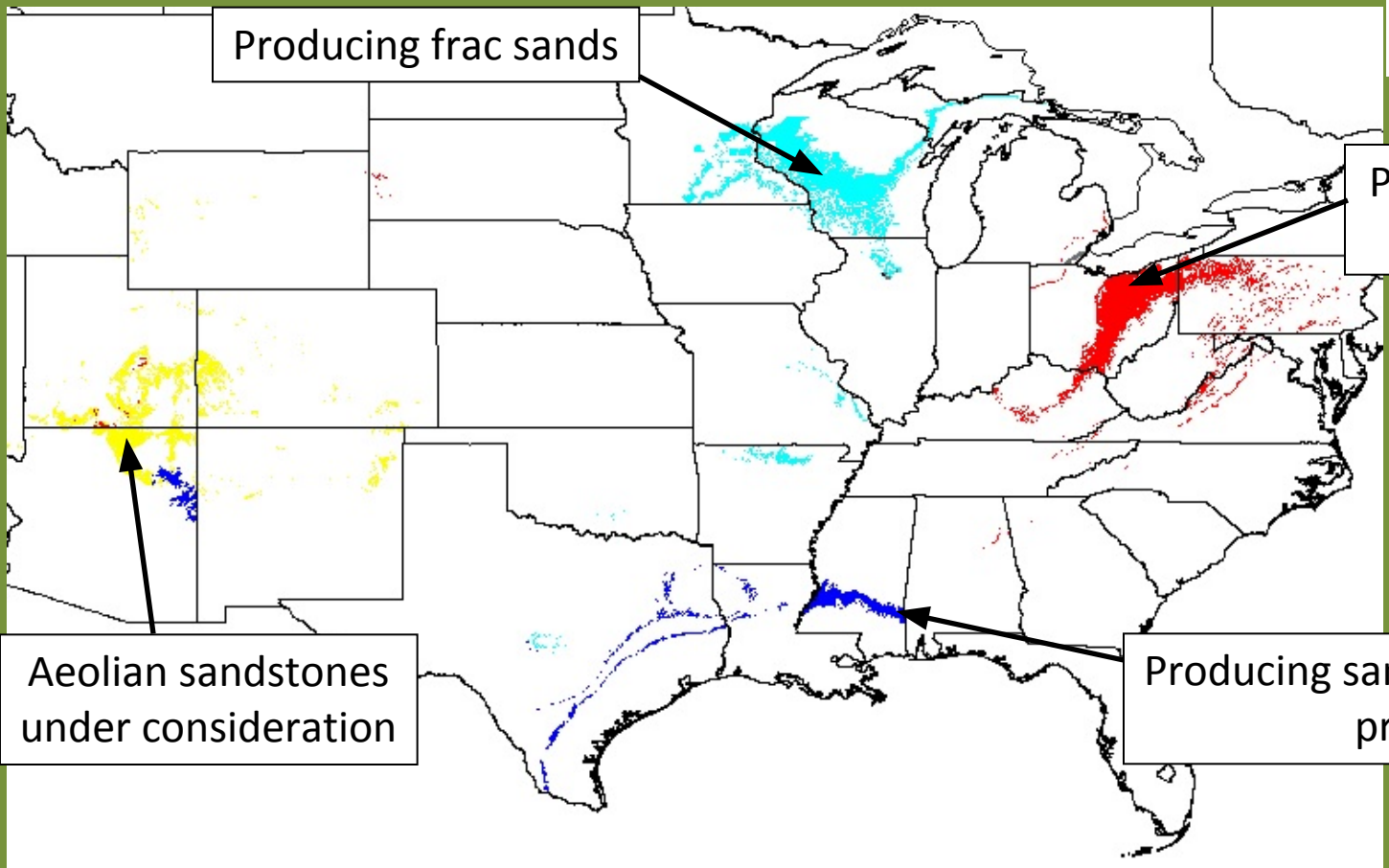




Future Concerns & Extent

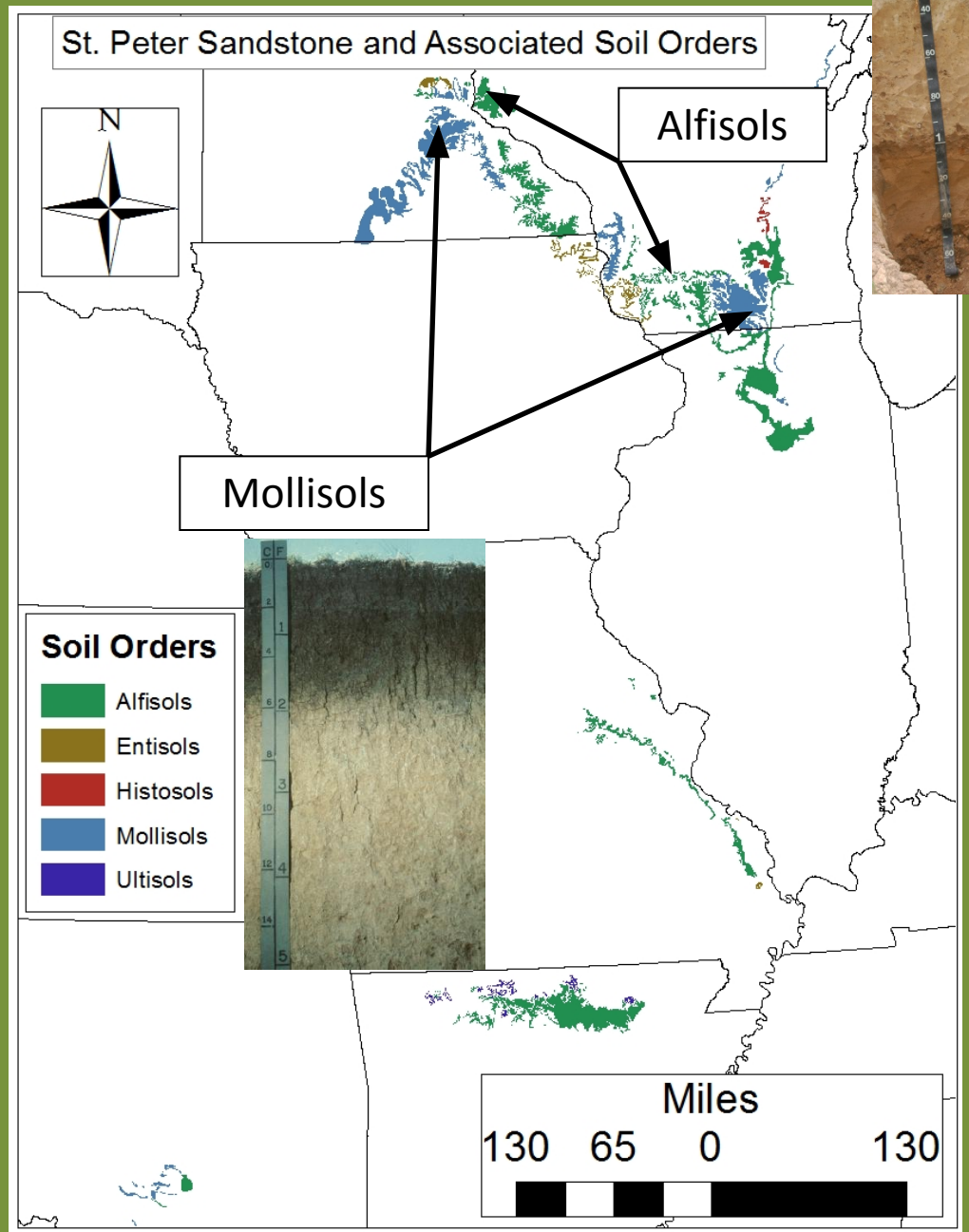
- **The St. Peter Sandstone (SPS)**
- **Secondary and Tertiary Sand Plays**
  - **83,725 square miles across 16 states or 9.5* the St. Peter**





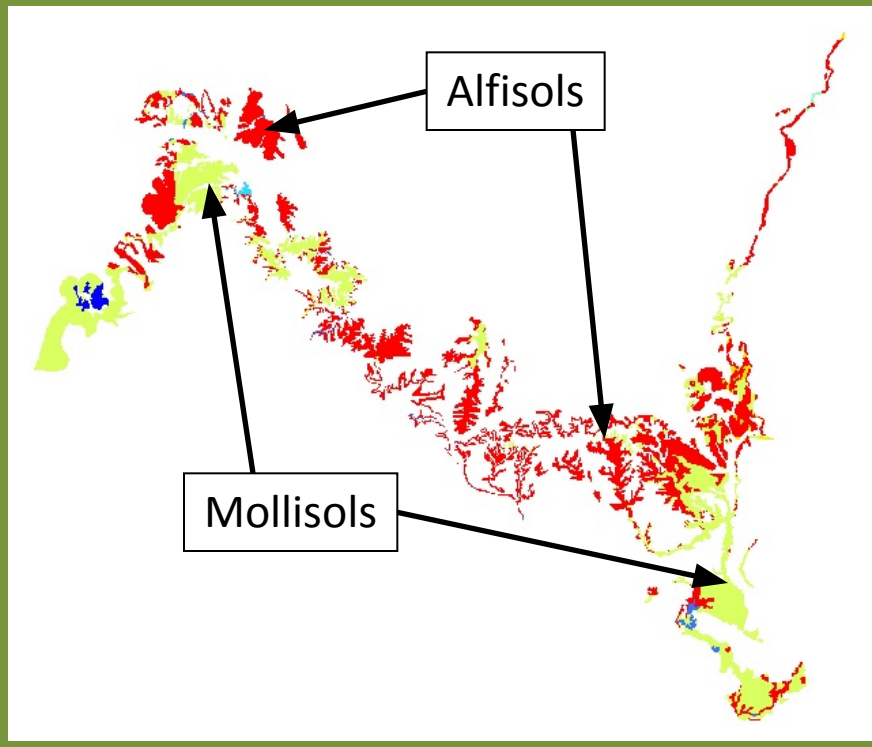
Sand Mining and Soil Security

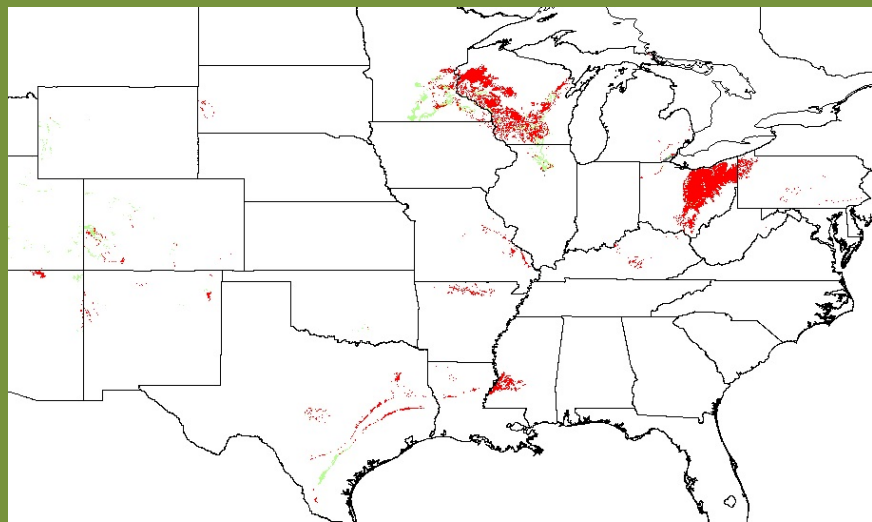
- **St. Peter Sandstone forests & grasslands offset annual CO_2 emissions of 5.6 million Americans**



Sand Mining and Climate Change

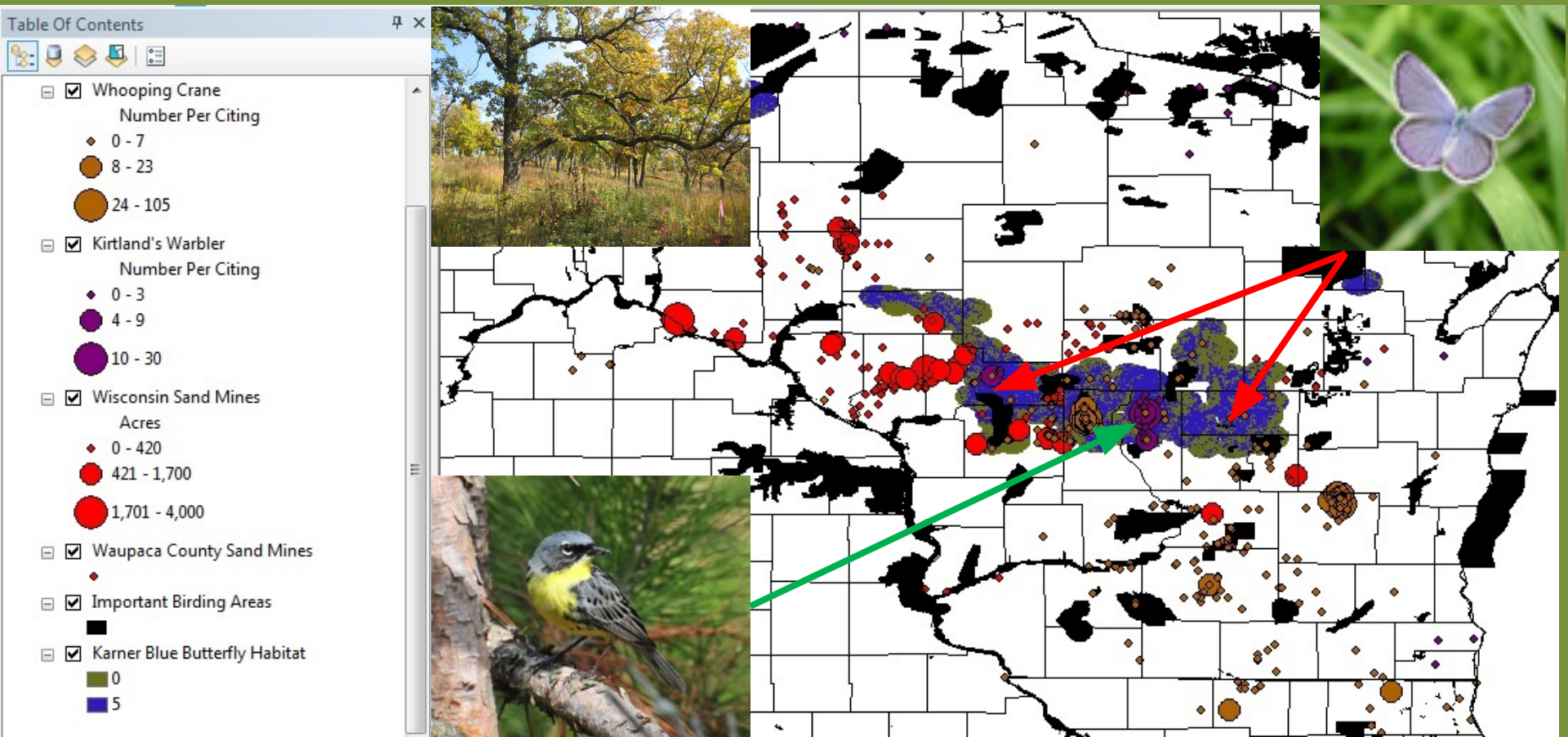
- Producing and Potential Plays sit beneath ecosystems that on average generate **2* more soil organic carbon (i.e., carbon farming) and 1.6* more plant biomass**
- West Central Wisconsin's forests accrue 63-131 MT CO_2 per year or 4.8-9.8 BT assuming ages of 65-85 years (Note: Equivalent to 3.2-6.6 million Wisconsin residents)
  - St. Peter parcels in Wisconsin generate $2.6-3.2 billion in commodities
  - $3.8 billion in ecosystem services per year and $15-48 billion in forest derived services
- Soil Security – 90% of St. Peter sits beneath some of the most productive agricultural soils in North America
- **Nearly 50% of 83,725 square miles nationally in the North American "bread basket"**





Sand Mining and Species/Ecosystems At Risk

- **Species of concern include the Karner Blue Butterfly, Kirtland's Warbler, Whooping Crane across the Great Lakes**
  - **Big and Little Brown Bat, Cerulean Warbler, Timber Rattlesnake, Roundstem Foxglove, Jeweled Shooting Star, Heart-Leaved Skullcap, White Camas, and Wolf's Bluegrass**
- **Ecosystems of concern include "globally imperiled" or "globally rare" including oak savanna, dry prairies, southern dry-mesic forests, pine barrens, moist cliffs and oak openings.**



Sand Mining and Species/Ecosystems At Risk

- **Across Lake Michigan concerns include threatened and fragile coastal dune ecosystems and**
  - **Threatened or endemic species include Pitcher's Thistle, Wormwood, Sea-Rocket, Clustered Broom-Rape, and Marram Grass, Fringed Polygala, Green Twayblade, Slender Ladies Tresses**
  - **Dunes are critical to the life-cycles of 10+ bird, reptile, and herbvivore species including the Eastern Hog-nosed Snake, Eastern Box Turtle, American Goldfinch**

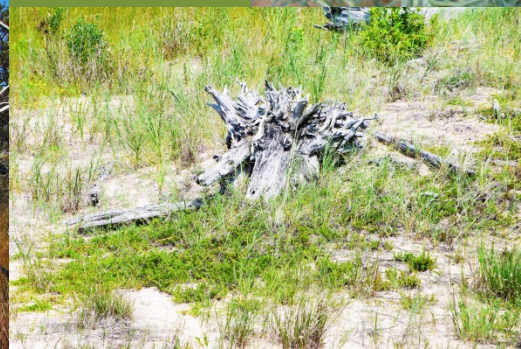
Criteria	# of Species within Michigan's Dune Complex
Michigan Threatened Species List	72
Michigan Endangered Species List	7
Michigan Rare Species List	3
Extinct	4
US Endangered Species List	1
US Threatened Species List	11

Modified from State of Michigan Department of Natural Resources, Geological Survey Division, 1979.







Sand Mining and Species/Ecosystems At Risk

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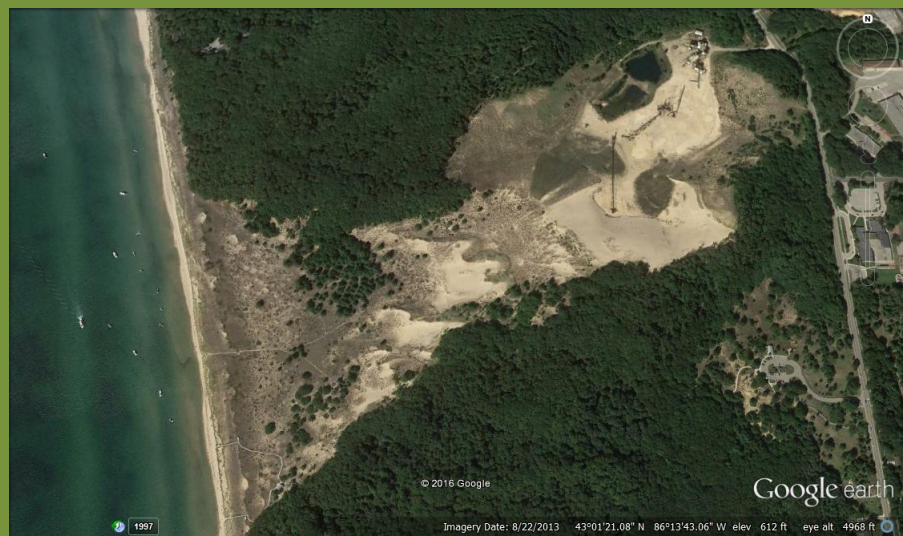
"Many of the fundamental concepts of plant succession and ecology were first identified as a result of studies made on Lake Michigan's sand dunes [by the preeminent ecologists Eugene Odum and Henry Cowles because]...the dune environment is unique in that the various stages of plant and animal succession can be viewed simultaneously in a small area. The struggle of plant communities to pioneer and evolve on barren sand is a complex process known as succession, in which natural communities \replace each other....Dune systems are well suited for the study of succession and ecological change because of the rapid changes which occur... **Unlike other fauna and flora which may be spatially shifted, or temporarily decreased or increased in number by a sand dune change, some species may be irreversibly damaged or destroyed by a chance in the dune environment."**

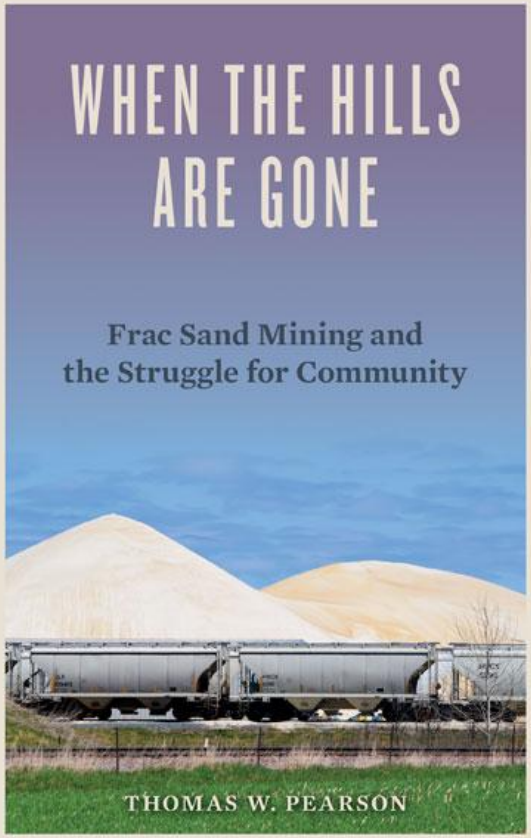
PRE

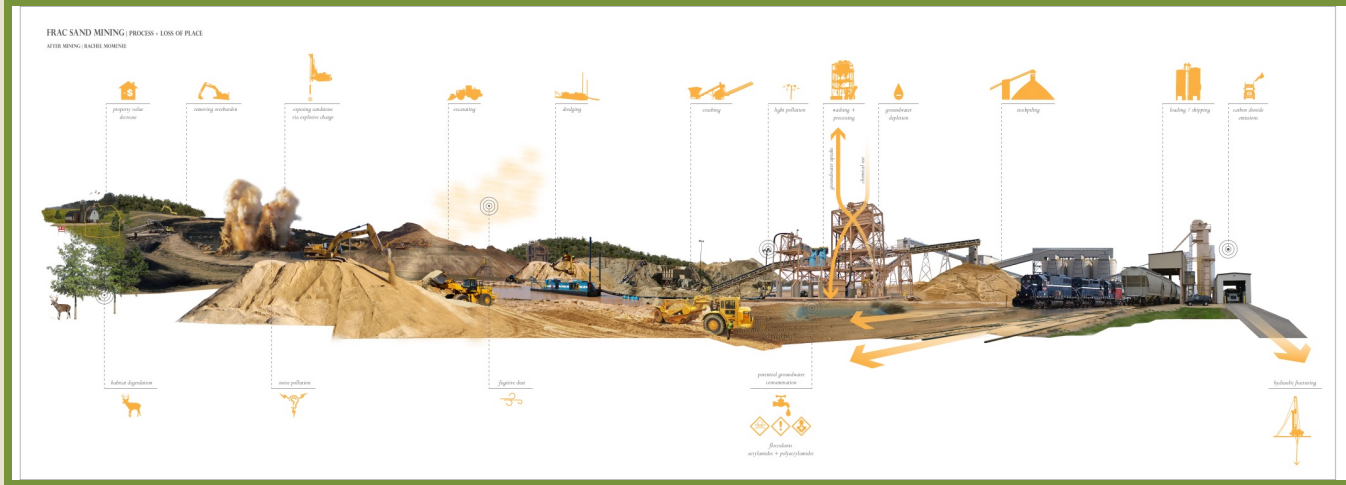
POST



Recently Completed Research

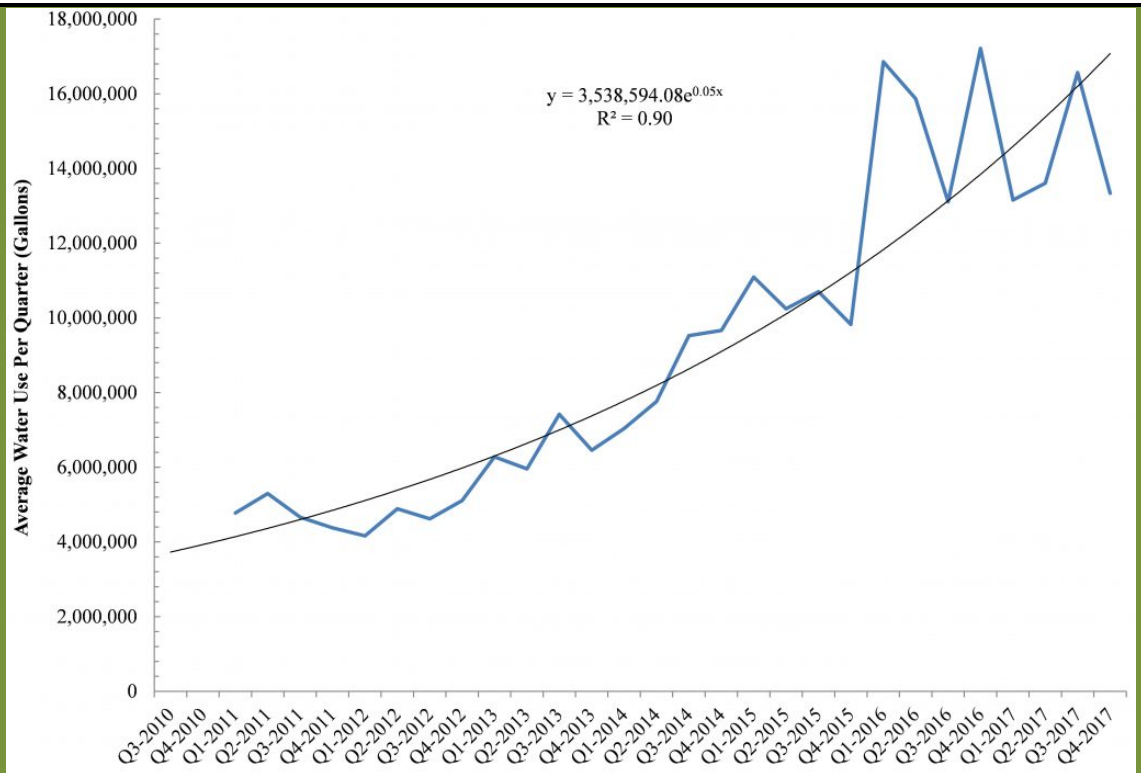
- Evelyn Hammond, UW-Madison, *"Public Perceptions of Frac Sand Mining Activities" survey*
- Rachel Momenee, UW-Milwaukee, *"After Mining"*
  - Re-thinking reclamation – stitching together the wounds of Wisconsin's frac sand mining industry to create a network of productive landscapes that enable new forms of economy, ecology, education, and entertainment
- Tom Pearson's writings





“High Cap” Wells and the Wisconsin Frac Sand Industry

- Silica Sand Mining and Water
  - 100-350 gallons H_20 per 1 ton of sand
  - Additional 4-10 MGs of freshwater per lateral bringing the grand total water demand to 20-27 MGs per lateral
    - Water ↑ 16-25% PYPL
    - Lateral Length ↑ 3.1-3.7% PYPL
    - **Proppant Demand ↑ 16-20% PYPL**



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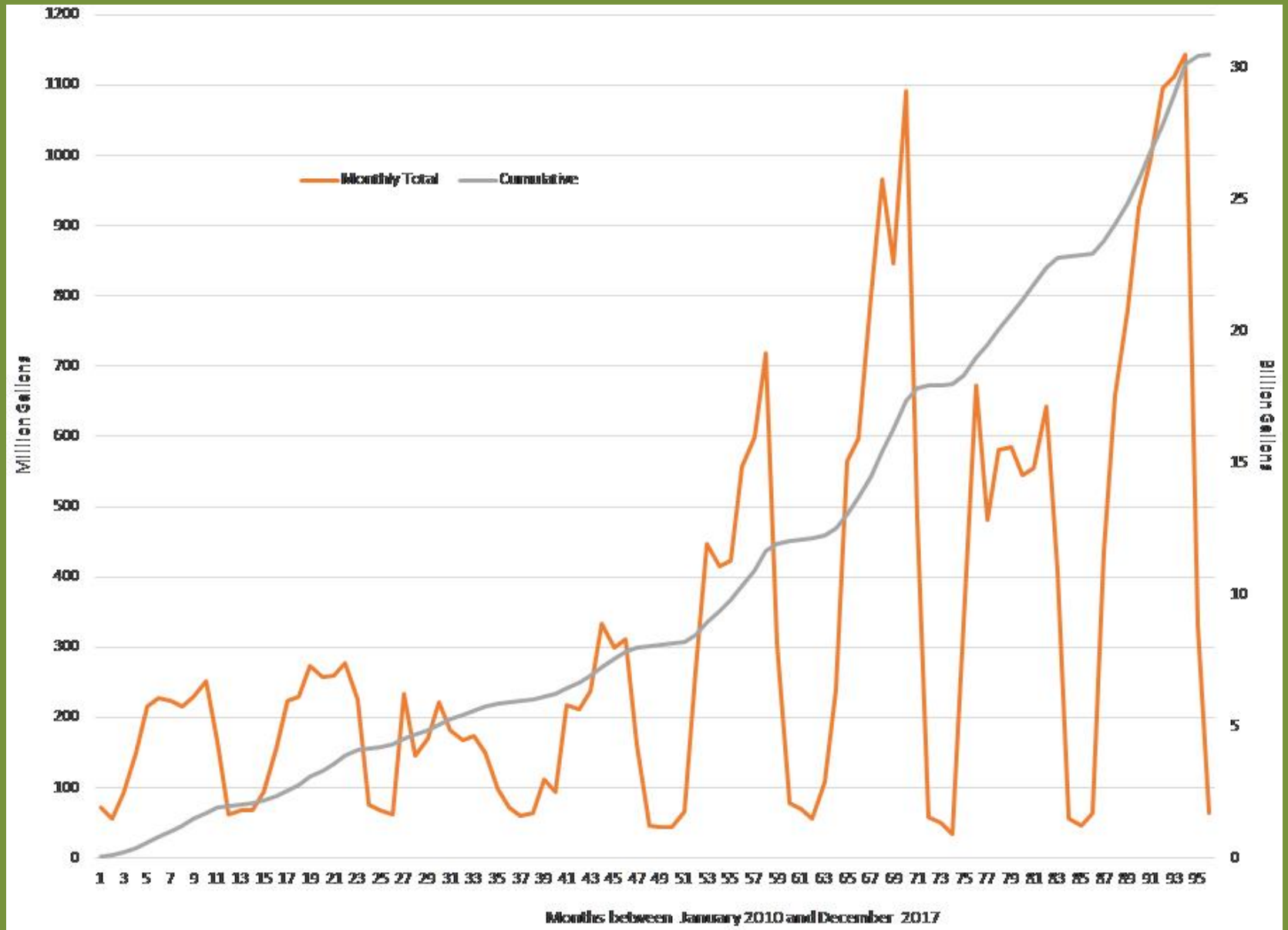
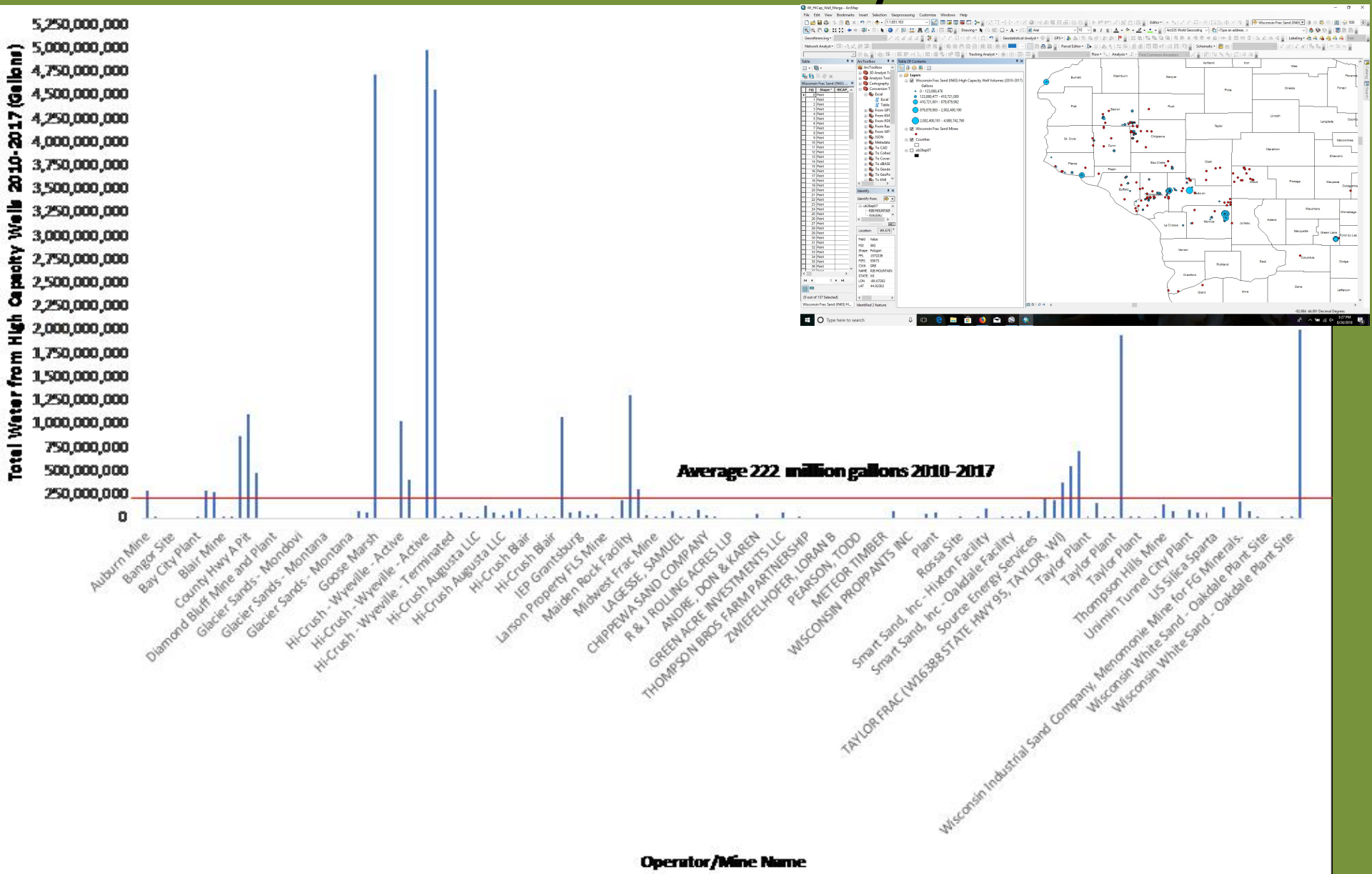
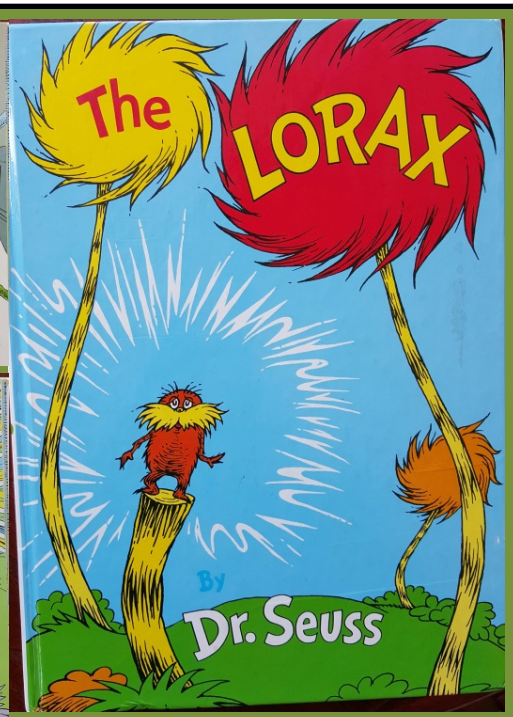


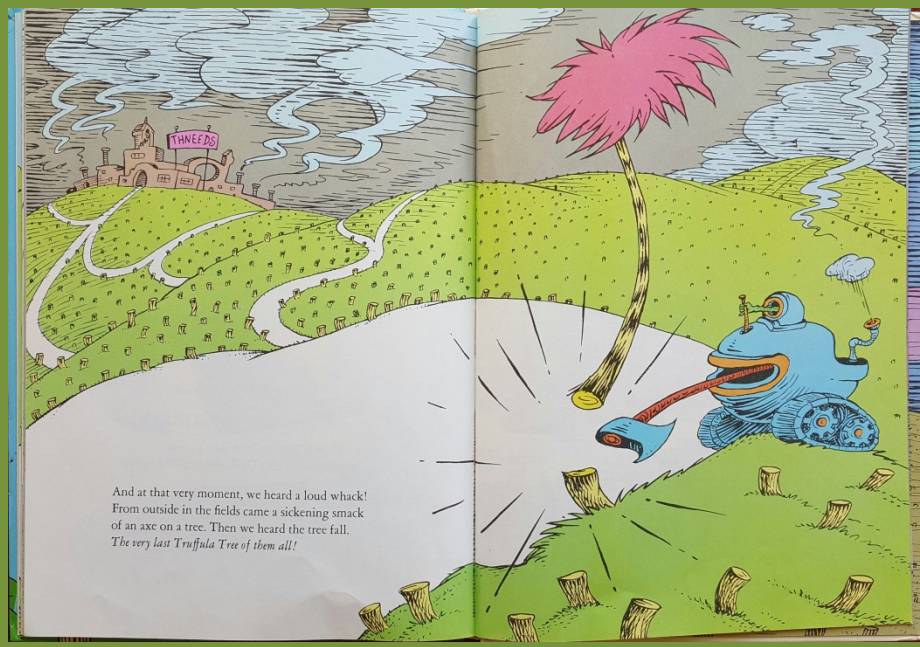
“High Cap” Wells and the Wisconsin Frac Sand Industry



Questions or Comments

"And deep in the Grickle-grass, some people say, if you look deep enough you can still see, today, where the Lorax once stood just as long as it could before somebody lifted the Lorax away. What *was* the Lorax? And why was it there? And why was it lifted and taken somewhere from the far end of town where the Grickle-grass grows? The old Once-ler still lives here. Ask him. *He* knows."





""But now," says the Once-ler "Now that you're here, the word of the Lorax seems perfectly clear. UNLESS Someone like you cares a whole awful lot, nothing is going to get better. It's not. "SO...Catch!" calls the Once-ler. He lets something fall. "It's a Truffula Seed. It's the last one of all!! You're in charge of the last of the Truffula Seeds. And Truffula Trees are what everyone needs. Plant a new Truffula. Treat it with care. Give it clean water. And feed it fresh air. Grow a forest. Protect it from axes that Hack. Then the Lorax and all of his friends may come back."