Final Report on the Public Health Impacts of Non-Metallic Industrial Sand Mining in Trempealeau County

September 8, 2014

Authors:

Sally Miller, John Aasen, Dave Larson, Sherry Rhoda, Paul Winey, Cristeen Custer, Liz Feil, Pam Nelson, Ellen Ott Gundersen, Tim Zeglin, Lois Taylor, Dr. Sarah Slaby

Table of Contents

Executive Summary.....3

Summary of Subcommittee Findings and Recommendations.....6

Stable Communities Report.....17

Stable Communities Recommendations.....63

Water Report.....72

Water Recommendations.....84

Light Report.....89

Light Recommendations.....96

Sound Report.....100

Sound Recommendations.....107

Air Report.....110

Air Recommendations.....124

Radon Report.....130

Radon Recommendations.....131

Maps.....133

Appendices.....

Executive Summary

On August 19th, 2013, the Trempealeau County Board of Supervisors adopted a resolution submitted by the Trempealeau County Board of Health. The resolution, in addition to placing a moratorium on new mining activity, formed a study committee and charged it with "the responsibility to collect and analyze information" on NMISM and report their findings and recommendations back to the Board of Health, Environment and Land Use Committee, and the Trempealeau County Board (Appendix A). The committee was directed to examine six key areas: water quality, air quality, light pollution, sound pollution, radon and radioactivity, and the ability to maintain stable communities. The research question the committee formulated was "What impacts does non-metallic industrial sand mining (NMISM) have on the health and welfare of the citizens of Trempealeau County?"

The committee created ultimately included 12 members because of the change in county board supervisors after the April election. The individuals who served on the committee included Sherry Rhoda, Public Health Director; Sally Miller, Trempealeau County Board of Supervisors; Dave Larson, Trempealeau County Board of Supervisors; John Aasen, Trempealeau County Board of Supervisors; Tim Zeglin, Trempealeau County Board of Supervisors; Pam Nelson, retired nurse, member of the Board of Health; Paul Winey, Physician Assistant; Cristeen Custer, citizen; Ellen Ott-Gundersen, Nurse Practitioner, Gundersen Health System; Dr. Sarah Slaby, DVM, Arcadia; Elizabeth Feil, J.D. and citizen; and Lois Taylor, nurse and Village of Trempealeau Trustee (not officially representing the village). The work of the committee was supported by professionals from the Public Health Department, the Real Property Lister, the Land Records Department, Department of Land Management, and UW-Extension.

The Health Impact Study – Moratorium Committee (committee) used the Health Impact Assessment (HIA) model to identify the health effects to consider, to assess risks and benefits associated with NMISM, and to craft recommendations for policymakers.

The committee used a variety of methodologies. The majority of the work was an in-depth literature review of stable communities, ambient air quality, groundwater and surface water, light pollution, noise pollution, and radon and radiation. The committee also collected primary data through a citizen survey that was conducted by the UW-Extension office. The survey went to a random sample of 800 residents within a half mile of a permitted mine. A total of 255 surveys were completed and returned for a response rate of 32%. Focus groups were also conducted to probe deeper at some of the issues the committee was considering. The committee worked with the Land Records Department to create a series of figures to illustrate many key concepts. Members also worked with the Applied Population Lab (APL) at UW-Madison to develop key indicators for the county.

This report, in addition to the Executive Summary, includes a summary of all the key findings and recommendations by committee. Each subcommittee report is presented and includes the research that supports the key findings and recommendations that are made. The individual reports also include the references used by each subcommittee in writing their section. The last part of the report is the appendices that supplement the material provided in the main body of the report.

The committee used the following concepts in their analysis of the data:

- Support community stability.
- Improve pre-mining evaluation be improved.
- Require mining accountability.

- Guarantee natural resources after mining operations cease.

General observations and recommendations

- Trempealeau County officials should share the results of this summary and the final report with elected officials and the public throughout the county and encourage discussions of the implications of the report.
- Not all answers are known. Although sand mining has a long-standing tradition in Wisconsin, the scale and numbers of NMISMs is new to policymakers and citizens living with the consequences.
- It is critical to monitor air quality, groundwater quality, and surface water quality. These are highly valued, critical resources.
- As researchers learn more about the consequences of NMISM, local officials need to adjust policies appropriately.
- Policymakers need to develop and implement more effective ways to include all key stakeholders, including the public, in the decision making process.
- County agencies need to work together to educate, plan, and regulate around NMISM issues.
- Elected officials from towns, cities, villages, and the county need to begin having serious conversations about how they will work together to regulate NMISM so they negative impacts are minimized and potential positive impacts are maximized.

Summary of Subcommittee Findings and Recommendations

Stable Communities Finding and Recommendations

Key Findings

- *Residents in Trempealeau County value natural beauty, water, and the small town rural atmosphere and want local officials to protect these assets.*
- *Mining creates quality jobs that can increase income, but it decreases community stability because of its instability and impact on quality of life.*
- *Population and migration are important measures of economic diversity.*
- *The potential for positive economic outcomes from the growth in NMISM operations is directly related to the linkages in the local economy.*
- *A diverse economy is the primary source of growth in jobs.*
- *Modest growth in housing and the limited amount of available housing means the county will be less successful at converting commuting workers into residents.*
- *NMISM activity is associated with a lack of prosperity.*
- *Income is not driven exclusively by job creation.*
- *The benefits of mining are likely to accrue to the region while most of the costs will be borne by the residents who live in communities where mining occurs.*
- *Violations from operating mines affect the natural environment.*
- *NMISMs could negatively impact the county's tourism economy.*
- *Given environmental concerns, compliance with actual and stated post-reclamation usages needs to be monitored and verified.*
- *The statutory basis for annexation is an effort to make community growth an orderly process.*
- *Annexations are expected to meet a public interest standard when reviewed by the Department of Administration.*
- *The nature of annexation in Trempealeau County has changed over the past ten years.*
- *Municipal rules and regulations will change when land is annexed.*
- *Annexation's impact on municipal property tax revenues will vary.*
- *Annexation is contributing to the destabilization of communities in the county.*
- *Land parcel values are lost by towns when the parcels are annexed to a city or village.*
- *Wisconsin's school funding formula is based on student enrollment and equalized valuation in the district.*
- *School districts with higher equalized valuation receive less state aid (e.g., Blair-Taylor School District lost $500,000 in state aid in 2013 and $300,000 in 2014). Increases in student enrollments will increase state aids.*
- *A decrease in school state-aid is an added cost to local taxpayers unless there is an increase in student enrollments.*
- *The financial impact of NMISM on school districts has largely been left out of the debate on NMISM in the county.*

Recommendations

SC1. Enact a county-wide long-range strategic planning process that includes the development of a vision to help guide county policymakers. The plan should address the changes the county and

its communities are facing and develop strategies to manage the cyclical nature of NMISM and to mitigate the negative impacts that will result when mining operations cease.

SC2. Monitor key socioeconomic indicators on a regular basis. The review of the indicators can serve as the basis for a discussion of how community stability is being impacted and if further action needs to be taken. The committee worked with the Applied Population Lab at UW-Madison to identify the following indicators:

- The number and income of county residents working in county-based mines
- County-wide labor trends
- County migration patterns
- Per capita income
- Unemployment rates
- The demands for public health services and their related costs
- The value of owner-occupied housing
- The number and location of new dwellings

SC3. Track all fishing and hunting licenses sold in the county to determine if mining is causing changes in licenses sold.

SC4. Modify ordinances to limit the number, expansion and locations of mines. This would allow for the protection of the natural beauty, drinking water and environment that is identified in the current comprehensive plan.

SC5. When the comprehensive plan is updated, land use patterns of NMISMs and related information of interest to the public should be included.

SC6. Track bicyclist numbers and organized rides to determine if mining has a negative effect on the number of bicyclists and related tourism that occur in the county.

SC7. Designate “Scenic Beauty” highways and other areas where mining cannot commence. This should be done to protect the natural landscape that is highly valued by residents and visitors.

SC8. Conduct an economic impact analysis of the deer-hunting season in Trempealeau County.

SC9. Request the Wisconsin Department of Natural Resources to track animal (i.e. deer, turkey) migration patterns in areas where blasting and light pollution occur, and evaluate the effect on animal populations.

SC10. Tighten reclamation plans to have fewer acres open at one time, as well as shorten the amount of time these mined areas can be open.

SC11. Compare the intended post-reclamation land uses to the total acres lost and the pre-mining land uses. The area reclaimed should at least equal the number of acres mined. Post-reclamation land uses should be compatible with pre-mining uses and municipal comprehensive plans.

SC12. Monitor the maintenance of "reclaimed" land for at least five years before release of the reclamation bond is made. Assurance of surface and ground water quantity and quality must be guaranteed. Longer time frames may be necessary based upon outcomes of current reclamation studies being conducted.

SC13. Conduct research on reclamation in Trempealeau County similar to the one currently being conducted by UW-River Falls in Chippewa County. Funding for the study should come from permit holders.

SC14. Pass a resolution condemning the use of "balloon on a string" annexations.

SC15. Encourage towns to attempt cooperative boundary planning (authorized under s. 66.0307) with their urban neighbors to minimize the impact annexations are having on towns and cities in Trempealeau County. The Town of Lincoln is currently participating in this process with the City of Whitehall.

SC16. Encourage town officials to apply for a DOA public interest opinion when an annexation is proposed cooperative boundary planning has not worked.

SC17. Adopt a resolution supporting state legislation that would prohibit annexations in which more than 50% of the annexed area extends farther than ¼ mile away from existing city limits at the time of annexation.

SC18. Monitor property sales close to NMISMs to determine if there are any changes in sales and property values over the next 10 to 20 years.

SC19. Monitor public resources (i.e., tax revenues) being used to maintain sufficient infrastructure.

SC20. Conduct on-going research looking at the following issues:

- Town strategies to increase public resources (i.e., tax revenues) to offset property value loss of annexed land parcels.
- Impact on the tax base of the reclaimed land.
- Land value of the reclaimed land.
- Tax impacts on residents of cities/villages who have annexed NMISMs.
- NMISM tax contributions to local units of government including total revenue and share of total revenue.

SC21. Increase the permit application fees on mining permits to cover the added expenses of the above recommendations.

SC22. Cease permitting additional mines until the county is able to monitor the actual costs and impacts of NMISMs as outlined in these recommendations.

Groundwater Findings and Recommendations

Key Findings

- *Groundwater in Trempealeau County is susceptible to contamination.*
- *Groundwater quality varies throughout Trempealeau County.*
- *Groundwater is expensive to clean.*
- *Trempealeau County has sufficient groundwater to meet current demands, but demand is increasing.*
- *Non-metallic Industrial Sand Mining (NMISM) can impact groundwater quality.*
- *Blasting is impacting wells in Trempealeau County.*

Groundwater Recommendations

GW1. Permit holders will develop and provide to DLM a groundwater monitoring and mitigation plan. The plan (adapted from the MEQB, 2014) shall include the following components:

a. A review of all available hydrogeologic data. It shall include an assessment of groundwater vulnerability throughout the lifespan of mining operations and reclamation.
b. Identification of all chemicals that will be used at the site. This information shall include all known residual contaminants and known breakdown products. Permit applicants will also describe how the chemicals will be managed and identify potential pathways for the chemicals to enter Trempealeau County water resources.
c. Identification of all groundwater users within a one mile radius of the site.
d. Identification of potential contaminant sources within a one mile radius of the site. A review of any known groundwater contamination within a one mile radius of the site should be included.
e. Identification of nearby surface waters that may encroach on the site during flooding.

GW2. Permit holders shall be responsible for installing, maintaining, and analyzing the data from a groundwater monitoring well network. Such network should be configured to provide adequate water quality information up gradient and down gradient of the project site.

GW3. Permit holders shall be responsible for collecting groundwater samples from monitoring wells and drinking water wells within 1 mile radius of the site prior to mining operations. This will establish “background” groundwater quality.

GW4. Once mining begins, monitoring wells shall be tested quarterly for the following parameters:

a. pH
b. Hardness
c. Specific conductivity
d. Temperature
e. Total coliform bacteria
f. Nitrite + nitrate-nitrogen
g. Iron, manganese, and arsenic.
h. Volatile organic compounds (VOC’s) to detect leakage from vehicles and equipment used at the site

GW5. Drinking water wells within 1 mile of the site shall be tested annually by the permit holder for the parameters listed in GW4.

GW6. Anionic food grade polyacrylamide-based flocculants should be used in order to minimize the potential for acrylamide contamination. At sites using polyacrylamide-based flocculants:

a. Acrylamide
b. Total Kjeldahl nitrogen (EPA method 351.2)
c. Nitrate+nitrite (EPA method 353.2)

GW7. We recommend that poly-diallyldimethylammonium chloride (p-DADMAC) based flocculants not be used in any NMISM operations because testing methods are currently unavailable.

GW8. All sampling and monitoring results shall be submitted to the DLM annually. Any results that show potential contamination will be subject to additional monitoring and mitigation as requested by the DLM following their review of the annual results.

GW9. Monitoring shall continue for a minimum period of at least 5 years following final site reclamation. Further monitoring may be required based upon a review of the monitoring data compiled.

GW10. All blasting shall follow best management practices. Any damage to livestock, buildings, infrastructure, and wells within one mile of the site shall be the responsibility of the permit holder to repair or replace. Damage beyond the one mile radius of the site shall be evaluated by

an independent consultant, at the expense of the permit holder, to determine the impact blasting had on the damage.

GW11. Water from any high capacity well permitted in Trempealeau County cannot be transferred or sold industrial or agricultural use out of the county.

GW12. The county will at least maintain the current distance of 10 feet of NMISM from the water table.

Surface Water Recommendations

SW1. The distance of NMISM from an exceptional water resource or a trout stream shall be increased.

SW2. The distance of NMISM from any other wetland or waterway shall be increased.

SW3. All process and settling ponds shall be lined.

SW4. Create closed-loop systems to maximize the recycling of water and to eliminate potential discharges to Trempealeau County groundwater or surface waters.

SW5. Applicants shall test sediments accumulating in process and storm water ponds prior to reclamation for the parameters listed in GW4. If flocculants are in use on the site, the applicant shall additionally test for the parameters listed in GW6. These sediments/slurries shall not be discharged to the mine or used in reclamation until they meet federal and state health-based drinking water criteria for the contaminants in GW4.

SW6. Enclose all significant materials and processes to the extent possible to minimize contact with storm water.

SW7. Storm water retention ponds need to be bigger by a minimum of 75% and use best practice management when constructing the retention ponds.

SW8. The sand/mud/flocculants sludge must be stored in a designated location with well-constructed berms or retention ponds to prevent run off of the material after a heavy rain.

SW9. Any natural waterways should be monitored (during mining and several years after mining) for water quality within a half mile of a mining site by county officials.

Light Pollution Findings and Recommendations

Key Findings

- *Light pollution impacts the health of humans and wildlife.*
- *Levels of light pollution are increasing in Trempealeau County.*
- *Trempealeau County light pollution standards are unique to each site.*
- *Light from mining and its related operations have impacted county residents.*

Recommendations (per Minnesota Environmental Quality Board [MEQB])

L1. Establish lighting ordinances that can be used to determine performance standards for all sources of night-time light.

L2. Create lighting zones that range from LZ0 to LZ4 (where LZ stands for "light zone"). These zones should follow the specifications spelled out in MEQB's *Tools for Local Governments* (2014).
In summary, the specifications include the following:

- LZ0 with .5 lumens per square foot will be the default zone for wilderness areas, parks, preserves and undeveloped rural areas.
- Up to LZ4 may be the default zone for areas with very high ambient lighting level needs such as heavy industrial users.

L3. Each lighting zone would have standards for the amount of allowable base lumens per site following guidelines set in MEQB's 2014 report (2014)

L4. New developments would have to comply with the lighting performance standards prescribed in the local lighting ordinance.

L5. Photometric plans would be a requirement of CUP's. Plans would include the following components:

- A pre-construction analysis to establish baseline night sky conditions.
- An assessment of future light impacts from NMISM and related activities.
- Changes (with the exception of emergency lighting) must be approved prior to implementation.
- A photometric diagram showing lighting levels of proposed fixtures.The plan should include the location and limits of outdoor lights and a photometric diagram showing predicted maintained lighting levels of proposed lighting fixtures.

L6. The lighting ordinance would include the following criteria:

- Require outdoor lighting with color temperature specifications no greater than 3000K.
- Require full-cutoff outdoor lighting fixtures.
- Specify zero percent uplight emissions above 90 degrees for area lighting.
- Require outdoor lighting fixtures that must be aimed, located, and maintained to prevent glare.

- Specify zero percent "property-line" backlight emissions to prevent light trespass onto adjacent properties.
- Stipulate adaptive lighting controls to dim or extinguish lighting when not needed in order to reduce wasted light.
- Encourage use of high-pressure sodium lamps and narrow-spectrum Light Emitting Diode (LED) lighting systems when color rendering light is not needed.

L7. Consider hiring or contracting with an engineer or lighting professional to work for the county to review and approve projects at the cost of the applicant.

Noise Pollution Findings and Recommendations

Key Findings

- *Noise levels impact the health and well-being of people.*
- *Current noise limits do not protect county residents from the negative impacts of noise.*

Recommendations

N1. Revise the existing county Non-Metallic Ordinance as follows:

a. Create a daytime average noise limit of 50 decibels from processing, extracting and transportation activities during extraction hours.
b. Reduce the nighttime noise limit to 40 decibels. This 40 decibel limit is not an average, but rather a strict limit, recognizing not only the adverse health effects of nighttime noise above 40 decibels, but also recognizing the need to preserve the quiet rural nature of the county and the positive benefits of this quiet on the health and well being of residents.
c. Apply these limits at all points on affected properties, so that affected property owners will have full use and enjoyment of all of their property.

N2. Maintain in effect the balance of the noise regulations contained in the Non-Metallic Mining Ordinance, including the phase-one noise survey, the phase-two noise survey, and the procedures for waivers and complaints.

Air Quality Findings and Recommendations

Key Findings

- *Particulate Matter (PM) is correlated with significant health problems.*
- *Controlling PM can improve health.*
- *Trempealeau County may face increased air pollution potential because of the number of NMISM in close proximity to one another.*

- *Crystalline Silica is a PM of particular concern in NMISM.*
- *The lack of reliable, accurate research about NMISM suggests extreme caution is the prudent response.*

Recommendations

AQ1. Monitor air quality for PM 2.5 and PM 10 at property boundaries of existing Non-Metallic Industrial Sand Mines that are 1 acre in area or greater AND extracting silica. In addition to air quality monitoring at the mine site, monitoring should also be done at any location where the dry product is transferred, transported and/or stored and fugitive product could be generated. The monitoring should be done according to EPA guidelines regarding placement of monitors, filter types, and allowable limits for daily and annual averages etc. Though monitoring for PM4 is not an EPA standard, sorting out PM4 can be helpful in identifying the source of the particulate, (silica) and has been used in a cited industry study.

AQ2. Permit holders would be responsible for obtaining air quality samples every 3 days for 3 years. If daily and annual averages comply with EPA standards, the permit holder could petition the Board of Health or the Environment and Land Use Committee to reduce the frequency of sampling to every six days. Air quality monitoring at the designated sites should continue until all requirements of the reclamation plan are met.

AQ3. Permit holders would be responsible for immediately reporting any exceeded EPA standard for particulate matter at which time the Department of Land Use would review and determine if operations should be immediately suspended. The Department of Land Use could allow resumption of mining activities after all recommended remediation requirements have been met.

AQ4. The county should consider ongoing air quality monitoring at sites where vulnerable individuals live, work or attend school. This could include: schools, nursing homes, assisted living facilities that are either within ½ - 1 mile of processing/mining or along transportation (truck or rail) routes. Air quality should be monitored inside and outside of buildings where vulnerable populations may spend time.

AQ5. The county should also consider air quality monitoring in areas where there are exposed populations (e.g. residential housing) living within a 1 mile radius of 2 or more mines and/or are situated along well used transportation routes. Data collected and compiled from these sites may be considered as demonstrating a cumulative risk. The Department of Land Use can identify these areas and implement an air monitoring program. This information may also be used to inform governing bodies of the potential impact of further permitting mines in areas where more than 1 mine is already operating.

AQ6. Responsibility of installing, maintaining, compiling, analyzing and reporting data collected from these sites should be the sole responsibility of the permit holder. The county departments of

Public Health and Land Use are responsible for oversight and periodic compliance review of the data. These departments should furthermore be responsible for an annual report to Board of Health, Environment and Land Use Committee and full County Board with their recommendations as information from the monitoring program comes to light and/or further scientific data are available.

AQ7. The County may impose additional fees on the industry to fund the personnel required to implement these recommendations.

Radon and Radioactivity Findings and Recommendations

Key Finding

*Radiation and radon in Trempealeau County is unlikely to be caused by or increased by NMISM***.**

Radon Recommendation.

No action is needed because radon is not likely to be an issue associated with NMISMs in Trempealeau County.

References

Minnesota Environmental Quality Board. (March 2014). *Tools to assist local governments in planning for and regulating silica sand projects.* Retrieved from https://www.eqb.state.mn.us/sites/default/files/documents/Tools%20for%20Local%20Govt%20approved%20March%2019.pdf

Stable Communties

Sub-committee members

Sherry Rhoda (chair), Cristeen Custer, Sarah Slaby, Paul Winey, and Timothy Zeglin

Introduction

The subcommittee was directed to look at the impact of NMISM on 'stable communities.' The challenge with such a directive is defining the term in way that allows us to assess the impact of NMISM. The sub-committee reviewed literature from public health and community development to arrive at the following definition, which guided our research efforts.

In a stable community the demands of society, business, education, and natural resources are balanced, while allowing individuals or groups to realize aspirations and satisfy needs and to change or cope with the environment.

Stable Communities Sub-committee

With this definition, the sub-committee conducted a literature review of the socioeconomic impacts of mining on rural communities. They also developed a county profile in cooperation with the Applied Population Lab from UW-Extension. The purpose of the profile is to connect the research with what is currently happening in the county, how it compares with neighboring counties, and with what can be expected to happen as the industry matures. Sub-committee members also undertook a review of existing data on what county residents value, what the annexation trends are, and how reclamation is occurring. The group looked at the impact of NMISM on property taxes, recreation, and tourism.

What do Trempealeau County residents value?

Background

Wisconsin Statute 66.0295, referred to as the "Smart Growth Law", requires all local units of government to develop and adopt a comprehensive plan in order to manage land use within their jurisdiction. The plan must address issues and opportunities; housing; transportation; utilities and community facilities; agricultural, natural and cultural resources; economic development; intergovernmental cooperation; land-use; and implementation.

Trempealeau County adopted their comprehensive plan November 2009. It is available on-line through the Department of Land Management (TCDLM) website (2009). This plan is intended as a guide for the development of ordinances that will provide for the managed growth of the county. The plan is a "living document" as each town periodically updates their individual comprehensive plan. The planning process has allowed individual towns the opportunity to engage their residents regarding significant changes within their boundaries. The advent of NMISMs is a significant change since the last revisions made to this plan.

> ***"Counties must take a long-term planning approach to minimize potential long-term negative impacts."***
>
> Deller & Schreiber, 2012.

The Stable Communities subcommittee completed a review of this plan focusing on the impact NMISMs may have upon these some of these elements. This section summarizes those findings into a usable data source for government officials responsible for short and long-range planning within Trempealeau County.

Key Finding 1

Residents in Trempealeau County value natural beauty, water, and the small town rural atmosphere and want local officials to protect these assets.

Each of the 15 towns in the county participated in a resident survey as part of the comprehensive planning process that required citizen participation. Individual township surveys can be found in appendices B and C of the Comprehensive Plan (DLM). These surveys where originally completed in 2008. A total of 2,773 surveys were distributed to county residents with 1,188 responses, a 43% return rate.

This subcommittee report looked at the results of four key survey questions. These included 1). Quality of life; 2). The single most important reason for living in the township; 3). Strategies for towns to work on; and 4). Prioritizing these strategies. See appendices A and B for responses from the comprehensive plan.

In the "Quality of life" section, respondents rated a list of potential responses as "Important", "Neutral", "Unimportant", "No Opinion," or "Did Not Answer". The seven categories each respondent was asked to rate included: "affordable housing," appearance of homes," natural beauty," "being near family and friends," "near job," "small town atmosphere/rural lifestyle," and "other". In the second question, respondents selected "The single most important reason for living within the township" from the list above.

The responses for "Quality of Life" were "Natural Beauty" 78.9%, "Small town/rural atmosphere" 78.3%, "Affordable housing" 60.7%, "Appearance of homes" 60.9%, "Being near family/friends 51.9%, "Being near a job 48.7%, and "Other" (4.1%). Written responses were not

identified in the tabulated survey results. The most important reason for living in the township was being near family and friends (23.4%); and small town atmosphere/rural lifestyle (23.3%). The next closest at 13.4% represents “did not answer”. All other selections were at 11.7% or less. This data is consistent with other surveys conducted in Trempealeau County according to a personal communication with Malone (personal communication, P. Malone, May 20, 2014). These results strongly suggest that people live in the county because of the natural beauty of county and being near family and friends. This is consistent with work done by Power and Power (2013b) that discusses the notion that people are willing to accept lower wages to live in an area with amenities (scenic beauty, rural lifestyle, family and friends) that they desire.

In the “Strategies” section of the survey, respondents again rated seven categories. The choices were: “increase coordination of local government,” “promote economic development,” “protect the environment,” “protect drinking water; preserve scenic views and undeveloped areas,” and “other”. The last section of the survey asked respondents to rank the top two strategies listed above. This section also included a possible response of “did not answer”.

The strategies respondents would like their towns to work on were the protection of drinking water (87.9%) and protection of the environment (82.5%). Preserving scenic views and undeveloped areas (73.1%); promoting economic development (49.9%); increasing coordination of local government (49.3%), and other (7.5%) were the rest of the responses. The “most important” of the top two strategies was “Protecting Drinking Water” and “Protecting the Environment” at 25.5% and 25.0% respectively. Promoting economic development (21.1%) and increasing coordination between local governments (11.2%) came in third and fourth as the “most important” strategy. The “second most

important" of the top two strategies was "Protect the environment" with 29.9%. Protection of drinking water was next at 19.3% followed by preserving scenic views and undeveloped areas at 17.0%.

The Town of Caledonia is the only unit of government in the county that currently recognizes a "mining" overlay district. This is intended to identify a specific area where aggregate mining can occur. It provides protection for the industry to ensure access to resources, and it provides protection to area residents from intrusion of mining into their neighborhood. As the comprehensive plan ages, towns are updating their individual plans. Two towns, Arcadia and Chimney Rock, have included language reflective of the advent of NMISMs. Other towns are in the process of updating and are awaiting the outcome of the moratorium documents before completing their plans.

Examining the results of this county-wide survey and other, similar, surveys done in the county illustrates the value that residents place on the county's rural atmosphere and natural beauty. The residents go even further by indicating that protecting drinking water and the environment are strategies they believe local officials need to pursue to preserve the quality of life in Trempealeau County. The chapters on air, water, light, noise, and radon will show how these important components of life in the county are being impacted by the growth of NMISM.

How do NMISMs impact community stability?

Background

Determining whether a specific industry is impacting the stability of a community is a complex task. Community stability is dependent on a host of factors that includes more than the natural environment. It also includes economic vitality and jobs and health as well as access to critical services

and amenities such as education and government.

In the past decade, Trempealeau County has shown vitality as its economy has evolved from land-based economic activities towards a more diverse professional services and manufacturing based economy. The high quality of life in the county that is a result of the attractive natural landscapes, inviting small towns and rural areas, diverse cultural opportunities, and outdoor recreation potential has been central to this ongoing economic vitality (Power and Power, 2013a).

The Trempealeau County health impact study report seeks to identify benchmark data on demographics and populations to assess how NMISM could impact community stability in the county. Included in the report is extensive demographic data on the county with some comparison data from its neighboring counties. The focus of this section of the report is twofold: 1.) What does existing research say about the impact of mining on communities, and 2.) What do key stable community components such as employment, household status and populations, tell us about the status of the county today and into the future?

The county is now at a crucial point. Recent decisions to permit 26 NMISM could be the cause of significant changes. The influx of NMISM operations could disrupt the lifestyle of thousands of residents, change the property tax structure of county municipalities, disturb the strong employment sector, and permanently alter the natural landscape. Public policy decisions or indecisions in the next few years will determine the stability of the county for generations.

Because NMISMs are still in their infancy, making policy decisions may be challenging for local leaders and citizens with limited *hard* evidence about how the impacts of NMISM will materialize. This is where a review of the current economic literature on the impacts of mining and an examination of

the county's unique socioeconomic profile can guide policy makers.

Key Finding 2

Mining creates quality jobs that can increase income, but it decreases community stability because of its instability and impact on quality of life.

Mines do bring jobs to communities. These jobs, for the most part, pay high wages relative to other local employers and offer excellent benefit packages. The question is who takes these jobs? In a fact sheet written by Deller (2012), he examines the research and summarizes that residents who are unemployed or underemployed may take the new jobs if their skill sets meet the job requirements in the short-term(Deller, 2012). Deller also points out that the situation changes over time as people move into the community for the jobs or decide to commute to mining jobs from elsewhere in the region (2012). The income generated by these jobs will benefit the region as it is spent on housing, services, and recreation**. In the long run this benefit accrues to the county only as much as local residents are hired or people choose to move to the county for these jobs** [emphasis added]. The more likely outcome, according to Power and Power (2013a) is that mining employees will commute into the area in order to avoid the potential negative consequences of living in a mining area (Power & Power, 2013a).

A challenge associated with mining jobs is the industry's instability. Demand for sand will rise and fall with changes in the price of oil and natural gas. As mining employment changes when mining operations expand and contract, the local community can be impacted; this is more likely to be the case in rural areas (Deller and Schreiber, 2012). What may mitigate this effect to some extent is the movement of the industry from labor to capital. According to Deller (2014) the "flickering" effect has been decreasing over time. If fewer people are hired, there are fewer people to lay off when there is

a downturn in the industry.

The number of local people hired by the mines is also a function of how many people in the local labor pool are unemployed. Unemployment in the county has been significantly lower than in the state and the nation. The total number of unemployed workers in the county was 709 for November, 2013, for an unemployment rate of 4.3%. This compares with the state unemployment rate of 6.4% and a national rate of 7% for the same time (MRRPC, 2014).

In addition, Trempealeau County is predicted to have steady job growth through 2022. Through 2012 and 2013, Trempealeau County experienced a 2.9% growth in jobs, compared with the state, which had a 0.9% increase in jobs.

A Workforce Connections report that focuses on workforce development in Region 9 (including Buffalo, Crawford, Jackson, Juneau, La Crosse, Monroe, Trempealeau, and Vernon counties) indicates that Trempealeau County has increased in the number of NMISMs since 2001. This report projects NMISMs will bring new jobs to the county. Construction jobs will also increase because of the need to keep up roads and other resources used by the mining industry. The report further notes that when mines in the county are not run by a locally owned business much of the revenue will not stay in the region to stimulate the local economy Workforce Connections [WD], n.d.). The report views the benefits of NMISM as a regional issue, and indicates that the benefits of this industry will be spread across the region. Other counties in the region may not have NMISMs in within their boundaries, but will reap the economic benefits because of their proximity to Trempealeau, Jackson and Monroe counties where NMISM is prevalent.

> ***"People are working. During construction there was a lot of activity. It had to have brought increased business sales and increased sales tax revenue."***
>
> Trempealeau County Official

The jobs offered by NMISMs are highly competitive with other jobs in the county requiring similar skill sets. In a personal communication with Malone (August 20, 2014), she noted that she has been able to contact two of the mines currently operating or in the construction phase in the county. The mine currently extracting sand has 30 full time employees on site and three part time office workers. The employees are offered an extensive benefits package that includes family health insurance, dental care, vision care, 401K, and paid time off. She also reported that the company stated that 90% of its employees live within an hour's commute of the mine. The other mine is currently in the construction phase. They have five full-time employees on site who have highly specialized skill sets and are from outside the region. The operator anticipates hiring 25 additional workers within the next year. The benefit package at this operation is also quite extensive (personal communication with P. Malone, August 20, 2014).

> ***Networks and neighborhoods are breaking down.***
>
> *Trempealeau County Citizen*

The focus groups conducted by Malone asked participants about the economic impact of the industry. In her summary, she noted that mines are providing jobs with wages that are luring qualified employees from local businesses. Mines are advertising locally for mid-range positions. The highest positions are not hired locally. Business owners noted that local firms are losing their best employees to the mines. These are experienced middle management workers who are difficult to replace at the current wages offered by local businesses. However, even NMISM's are not immune to "job hopping," according to Malone. She indicated that one mine had trouble retaining workers who moved on for a small increase in wages down the road

(personal communication with P. Malone, August 20, 2014).

Key Finding 3

Population and migration are important measures of economic diversity.

According to the United States Census Bureau (US Census), Trempealeau County is characterized as rural. With an estimated population in 2013 of 29,582, there are 39.3 people per square mile. This compares to 105 persons per square mile on average for the state of Wisconsin. The population growth for the county from 2000-2011 was 7.1%, less than the national average of 10.4% (2013). The overall growth rate for Trempealeau County has been 3.1% for the past five years. This compares to an overall growth rate for Wisconsin of 2.3% (Mississippi River Regional Planning Commission [MRRPC], 2014).

US Census data indicates rapid and significant growth in the Latino population has occurred in recent years. The county experienced the largest percent increase of the Latino population in in the state from 2000 – 2010 with an increase in this population of 595% (Applied Population Lab [APL], 2014a).

The 2010 US Census identifies the *40-59 years* age group as the largest age group in the county. See Figure 1. Latinos are most heavily represented in the *under 20* and *20-39* age groups. “Compared with the total populations statewide, Latinos have a greater proportion of the population in the younger age groups” (APL, 2014).

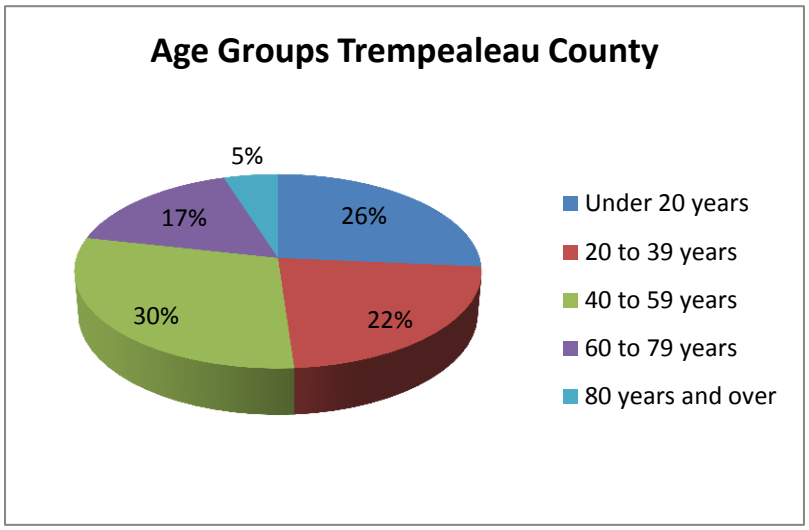


Figure 1. Trempealeau County population by age group (WDA, 2013).

The Wisconsin Department of Administration predicts population growth for the county of roughly 7% by 2020 and an additional 9% by 2040 which represents population increase of roughly 4,107 persons. Population projections indicate a decline in the *40-59 years* age group but an increase in all other age groups (Wisconsin Department of Administration [WDA], 2013). See Figure 2.

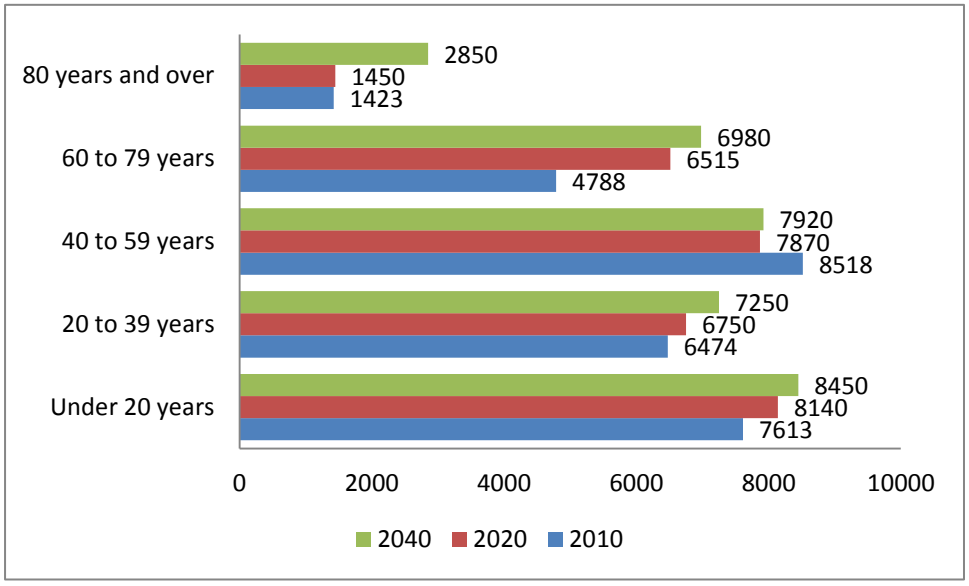


Figure 2. Population projections for Trempealeau County through 2040 (WDA, 2013).

The greatest population increases are predicted to primarily take place in towns (MRRPC, 2013b). The top five fastest growing towns over the period from 2010 to 2013 will be the Town of Trempealeau (33%), Town of Pigeon (31.3%), Town of Sumner (30.7%), Town of Dodge (29.3%), and Town of Unity (26.5%) (MRRPC, 2013b). Of these top five, only the Town of Pigeon is in the central part of the county where the majority of NMISM is concentrated. By 2030, population decreases are predicted to occur in the Towns of Arcadia (-7.7%), Lincoln (-.5%), and Preston (-2.4%), and the City of Arcadia (-8.2%) where the majority of NMISMs are located (MRRPC, 2013b).

The concentration of NMISMs is new to the county, so the impact on population cannot be determined at this point. Comparison data from a long-established non-metallic mine in a neighboring rural county identifies potential outcomes. The APL looked at population data for 2000 – 2010 in the region around a mine near Taylor in Jackson County, which shows very limited population growth within one to five miles of the mine. The population within one mile of the mine increased by nine persons in 10 years, from 22 to 31; the population within five miles of the mine increased by seven persons in 10 years, from 1,578 to 1,585.

The population projections for the county, coupled with the precedent of limited population growth near a Jackson County mine suggest the residential property tax base in Trempealeau County will not increase significantly in future years. Without proactive regulation and long-term planning, the infrastructure costs created by NMISMs will be borne by a taxpayer base that is not increasing.

Key Finding 4

The potential for positive economic outcomes from the growth in NMISM operations is directly related to the linkages in the local economy.

The answer to the question “Will NMISM be good for our local economy?” is a function of the

linkages the industry has within the community. Up to this point, mining firms have promised to bring jobs and economic vitality to the county. Projected economic contributions by mining firms are based on the assumption that the local community will retain all income and revenues. Data on actual economic outcomes and consideration of the costs of mining to citizens and their communities should be added to these assumptions.

An analogy often used by economists is to compare the local economy to a leaky bucket. Income pours into the bucket and leaks out by the holes that are created when the community is unable to provide goods or services that businesses and residents demand. The more the community can plug the leaks the more of the income will stay in the local economy. However, as pointed out by Power and Power (2013a), many of the inputs needed by the mining companies, such as their machinery and chemicals, are not available in Trempealeau County (or other rural areas). Deller (2014) notes that "Non-local ownership is generally associated with smaller economic impacts and lower local growth."

Workers migrating into the county for jobs can be expected to bring their paycheck back home. Regions that have significant commercial or service centers are more likely to capture a greater percentage of worker income. Trempealeau County has small commercial centers that that have had limited success in attracting mining-related purchases. These leakages decrease the potential impact the new economic activity will have on the county.

Mining economic forecasts often cite the multiplier effect of their operations. Deller, an Agricultural and Applied Economics Professor at the University of Wisconsin-Madison, explained "[t]he size of an economic multiplier hinges on two concepts. The first is the level of linkages an industry has with other businesses within the local economy. The second is the notion of leakages and the ability of

the local economy to retain dollars…. more urban economies tend to have larger multipliers than small and more rural economies. (S. Deller, personal communication, n.d.).

Deller performed an economic impact assessment of multipliers that illustrated the multipliers for two industries in western Wisconsin counties. He developed a preliminary economic impact assessment of the proposed Winn Bay Sand mine (now known as Preferred Sands.) Deller projected multiplier impacts in the range of 1.200 to 1.326. He noted the multipliers were quite small and were consistent with other economic impact analyses that had been previously done for Trempealeau County. He stated, “The county is very rural with limited opportunities to capture multiplier ripple effects (S. Deller, personal communication, n.d.).

By comparison, Deller offered the results of an economic impact analysis conducted for a Foremost Farms cheese plant in Buffalo County. The multipliers for that plant were in the range of 1.392 to 2.895. He noted, that for a county as rural as Buffalo County, these were large multipliers and most likely a reflection of the level of integration the cheese plant has with input suppliers and the relatively high wages for the region (S. Deller, personal communication, n.d.).

In the February 26, 2014 proposal to the City of Arcadia, AllEnergy outlined economic contributions it will make to the city (Millis, 2014). The document identified separate economic incentives AllEnergy will provide for the city. The justification for annexation in the cover letter and additional documentation is based on company largess, not just on the premise that the operation will bring intrinsic value to the city. This level of reasoning suggests that additional incentives, beyond the promised jobs and taxes, are necessary to create a significant economic linkage with the city.

The proposal to City of Arcadia included several components. AllEnergy Sand proposed a

residential development with its project, concurrently while the funding for the development was still in progress. AllEnergy Sand retained Cedar Corporation to analyze the City's ability to establish a new tax increment financing district in the event the City approves the proposed annexation. In addition, AllEnergy Sand reports that they have been and will continue to work with the Wisconsin Housing and Economic Development in pursing any funding available. AllEnergy Sand committed to reimbursing the City with reasonable costs incurred by the City as a result of AllEnergy Sand's proposed project. There is a request to vote in favor of the project, and to enter into an agreement with AllEnergy Sand to accept a financial offer. AllEnergy Sand proposed to give the Arcadia community up to $1,000,000 a year for 30 years.

Similarly, separate revenue enhancements were included in negotiations between Superior Silica Sands and the City of Independence. The agreement stipulates an annual royalty payment of fifteen cents ($.015) per ton will be paid to the city. The payment increases annually by one-half cent ($.005) annually. In addition, Superior Sands agrees to reimburse any fees for defending against legal claims that challenge the validity of their proposed annexation. These stipulations identify some of the risks that municipalities can face when collaborating with industrial sand mines.

Hi-Crush Partners recently annexed to both the cities of Independence and Whitehall. To sweeten its partnership deal, Hi-Crush gave an outright gift of $500,000 to the City of Independence (email from Independence City Clerk.) The consistent use of gifts to achieve annexation clearly implies that jobs and taxes alone are not considered sufficient reason for cities to collaborate with sand mines. This evidence discredits claims by mining firms that the economic impact of their operations will be a source for economic vitality in the county. The communication documenting these offers was acquired by making open record requests to the city clerks of the communities involved.

Key Finding 5

A diverse economy is the primary source of growth in jobs.

Economic growth is fueled when diverse employment options exist in amenity rich regions. When workers and families value the qualities of their local environment they are willing to work for less wages to gain access to those regional qualities. In regions where mining is prevalent, the jobs and payroll do not primarily flow to local residents, they are dispersed regionally.

Trempealeau County has taken advantage of the "amenity-supported local economic development" Power and Power describe in their 2013 paper (Power & Power, 2013b). This can be seen by reviewing the socioeconomic data put together for the subcommittee by the APL.

Once dominated by an agricultural economy, Trempealeau County has successfully cultivated a healthy and diversified employment sector in recent decades. Although the employment sector is heavily weighted toward manufacturing, which represents 39% of the available jobs, there is additional employment diversification in a variety of industries.

The growth in Latinos in the county has coincided with the increase of manufacturing jobs. The APL reported, "Statewide, a greater proportion of Latinos were employed in *Manufacturing* (over 23%) than in any other industry" (2014a).

While rural areas are often seen as being economically stressed, this has not been true for Trempealeau County in recent years. From 2000-2011, average earnings per job increased 16.9%. In addition, Trempealeau County saw an increase in per capita earnings of 12.4% compared to the national average of 5%. Over the same period, the county saw a 48% increase in non-service related jobs compared to the national increase of 14.8 % in non-service related jobs (Headwaters Economics,

2014).

The average earnings in Trempealeau County in 2013 were $40,870. This is 72% of the national average. An analysis of income by industry from January 2014 further exemplifies the value of a diversified employment sector. See Appendix D. More than 6,000 manufacturing jobs in the county provide an average income of $50,733. Mining jobs pay a higher average income, $69,622, but the industry provides only 44 jobs in the county (MRRPC, 2014).

Headwaters Economics (2014) stresses that ""As the economy of a place diversifies, it can become more resilient and less affected by downturns and rising unemployment rates. This is particularly true of places that are able to attract in-migration, retain manufacturing, and support a high-tech economy" (Headwaters Economics, 2014). Trempealeau County currently has abundant jobs and low unemployment. Additional job growth is forecasted. If an increased dependence on mining jobs occurs, employment instability could result because of industry and seasonal fluctuations and the eventual layoffs that result when mines close.

Key Finding 6

Income is not driven exclusively by job creation.

Jobs are not the only source of income for a region. Non-employment income may be less visible, but still represents a significant source of regional income. Non-employment income is predominantly tied to retirees. Factors that make a location a desirable place to live, regardless of age, are also tied to the economic vitality of a region (Power & Power, 2013a).

Heartland Economics has developed an online tool produce detailed socioeconomic reports of counties, states, and regions. The tool, the Economic Profile System-Human Dimensions Toolkit (EPS-HDT), provides detailed reports on population, employment and incomes. The EPS-HDT report defines

non-labor income as “dividends, interest, and rent (money earned from investments), and transfer payments (retirement, insurance benefits, Medicare, Medicaid, etc.)” (Heartland Economics, 2014). The results of the report indicate a steady increase in non-labor income in the county, as noted below:

- “In Trempealeau County, from 1970 to 2012, non-labor income grew from $125.2 million to $391.4 million (in real terms), a 213% increase” (Headwaters Economics, 2014).
- “From 1970 to 2012, labor earnings accounted for 59% of growth in total personal income and non-labor income for 41%” (Headwaters Economics, 2014).
- “In 1970, non-labor income represented 28% of total personal income. By 2012 non-labor income represented 36% of total personal income” (Headwaters Economics, 2014).

Because the desirability of a region is closely tied to holding and attracting retiree incomes and the 40-50 age group is predicted to decline, the county could experience a decrease in the population and incomes brought to the county by retirees with the impact of NMISM on quality of life.

Key Finding 7

Modest growth in housing and the limited amount of available housing means the county will be less successful at converting commuting workers into residents.

Affordable and accessible housing are quality of life indicators. In the county there are 12,619 occupied housing units (91.3%) and 1,095 unoccupied housing units (8.7%) (MRRPC, 2013a). There is a limited amount of available housing. Neighboring counties with greater numbers of housing units have the lowest percentage of unoccupied housing, La Crosse (4.7%) and Eau Claire (6.3%). Despite these low percentages, both of these neighboring counties have twice as many unoccupied housing units as Trempealeau County.

Of the total housing units in the county, 74% are owner occupied with 26% renter occupied. There was a 9.9% increase in total households from 2000-2010. This compares with a 12.9% increase in the state and 13.3% increase in the nation during this period (MRRPC, 2013a). Homeownership rates

for Latino households in the county are 25.6%. (APL, 2014b). This compares with a homeownership rate of 75.8% overall in the county. (MRRPC, 2013c).

The median value of owner-occupied units is $133,300 which compares with a state median value of $167,200. Of the five counties being linked in this project, Trempealeau County has the fourth lowest median value of owner-occupied housing.

> ***What do I do with my property if my neighbor sells to a mine? Especially and issue for small lots that do not have a lot of economic value to mine operators.***
>
> Trempealeau County citizen

Potentially aggravating the housing situation in Trempealeau County is the idea of proximity impact. Roughly 27% of the county population lives in a city or village that has close proximity to a mine. This is significant because proximity to mines has implications for the less desirability of living in the area and for an overall decrease in housing values.

Approximately 1,755 homes are located within one (1) mile of a mine (TCDLM, 2014). There are 11,673 households in the county, which means that 15% of households are now in very close proximity to a permitted mine. With an average of 2.48 persons per household, 4,352 individuals are living within one mile of a mine.

A demographic and proximity analysis of five operating, non-locally owned, mines ranging in size from approximately 180 to 1,300 acres indicate significant numbers of county residents live in close proximity (one to five miles) to a mine. The Applied Population Laboratory, used radius profiles of five operational mines to provide the analysis. The results are summarized in Figures 3. Given the relatively close proximity of these mines, many individuals are also likely to be living within five miles of multiple mines. Vulnerable and minority populations that live within one mile of a mine are represented

in Figure 4.

Mine	Population within 1 mile	Population within 5 miles
Arcadia Sands (~231 acres)	88	4,357
Alpine Sands (~180 acres)	199	3,927
Guza Mine(~489 acres)	56	2,639
Hi-Crush West (~680 acres)	120	4,296
Hi-Crush East(~700 acres)	28	4,517
Preferred Sands (~400 acres)	99	4,608

Figure 3. Population in close proximity to five operating mines (APL).

Mine	Percent of population under age 15	Percent of population over age 65	Percent of population Latino
Arcadia Sands (~231 acres)	29.5%	3.4%	75%
Alpine Sands (~180 acres)	36.8%	8.5%	4%
Guza Mine (~489 acres)	28.5%	10.7%	0
Hi-Crush West (~680 acres)	17.6%	13.3%	11.7
Hi-Crush East(~700 acres)	21.5	17.9	0
Preferred Sands (~400 acres)	24.3%	14.1%	0

Figure 4. Vulnerable and minority populations within 1 mile of five operating mines (APL).

The radius profile approximates the center of each polygon representing the area of the operational mines. Given the irregularity of the polygons, there is imprecision in determining the center point. More sophisticated analysis of population proximity to the perimeter of these mines would result in higher numbers of people located in close proximity to the mines.

In relationship to the NMISMs proximity to county residents, it is noted that more than 2,500 daily truckloads of sand are permitted on county roads (TCDLM, 2014).

> ***"If you don't like it, leave it" attitude from neighbors who have cashed in – but we don't have a bargaining position if the mines don't want our land.***
>
> Trempealeau County citizen

Key Finding 8

NMISM activity is associated with a lack of prosperity

A body of research exists to suggest that mining is ultimately more of a "curse" to a region than it is a benefit. Davies (2012) notes that the environment and infrastructure are negatively affected by mining and taxpayers have the burden of paying for the damage. His analysis also shows that homes adjacent to mines or transport routes lose value (Davies, 2012). Increasing competition for a limited pool of workers, while of benefit to the workers, raises wages and makes it difficult for local employers to compete for qualified workers. These local employers are also an important part of the fabric of the community. They are more closely linked to the community and are a critical part of its economic vitality. A review of research by Power and Power (2013b) shows that those counties most dependent on mining grow more slowly and are poorer.

Key Finding 9

The benefits of mining are likely to accrue to the region while most of the costs will be borne by the residents who live in communities where mining occurs.

The APL developed a tool that examines 60 years of age-specific net migration for counties in the United States to analyze patterns of migration and understand changes in population. The APL wrote, "[t]he movement of people is an important component of population change and examining net migration trends helps to unpack and add depth to understanding community character and social change" (2013). They also wrote, "[w]hen considered over six decades net migration by age for any county tends to form consistent pattern or 'signatures'. When combined with other data or local knowledge about a county, these signatures visually represent local demographic or economic stories,

help make comparisons, and provide an understanding of place-based causes and consequences of migration by age" (2013).

The APL produced migration signatures (at the request of the sub-committee) to establish a baseline understanding of migration patterns for Trempealeau County and its four neighboring counties, Jackson, Buffalo, La Crosse, and Eau Claire.

Figure 5 shows the migration signature for Trempealeau County over six decades. The Net Migration Rate per 100 is defined as the number of people who migrated in or out of the county. The net migration figure takes into account the births and deaths that occur in the county, and reflects the population increases and decreases that have taken place by decade.

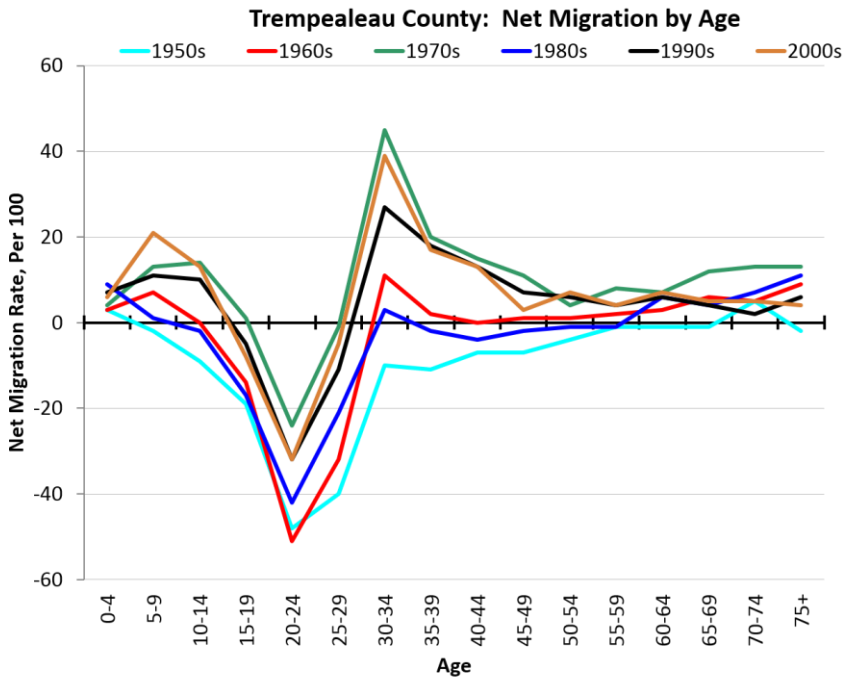


Figure 5. Trempealeau County Migration Signature, (APL).

As noted above, the six decade county net migration signature creates a consistent pattern. Over sixty years, Trempealeau County has had more people moving into the county for all age groups

except the ages of *15-29.* This trend is likely related to young people leaving the county for life in a city or for advanced education. In the 2000s, sharp increases of in-migration occurs for ages *30-34* in conjunction with ages *5-9*. These increases are likely related to manufacturing and agricultural jobs held by Latino workers moving into the county with their families. Migration decreases are evident between ages *34-45*. Commonly, individuals in this sector don't move around as much because this is the time period when they are raising their families. It is possible that this age sector is leaving the county for the opportunity to improve their income. This is a sector to watch to see if mining jobs increase retention due to higher incomes. The county has consistent and relatively low in-migration from age *60+*. This indicates that retirees are moving into the county at a modest rate. This is a sector to watch to see if the increases in mining operations causes more out-migration due to lower quality of life issues. Figure 6 shows migration signatures in The County and 4 neighboring counties.

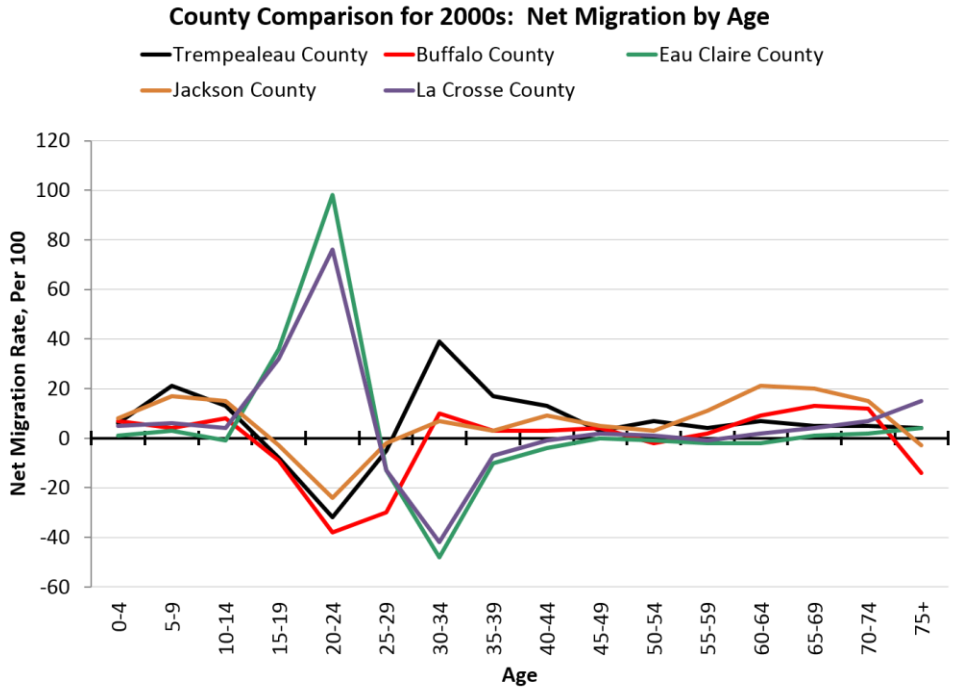


Figure 6. County Comparison for 2000s: Net Migration by Age, (APL).

Note the similarity in the signatures for the rural counties, Trempealeau, Jackson and Buffalo, compared to the similarities of the central metropolitan counties of La Crosse and Eau Claire. With higher education institutions, the metropolitan counties are the beneficiaries of the *15-29* age groups. Trempealeau County's strong employment profile is increasing population in the *30-39* age groups when all neighboring counties see either declining or stable populations. As previously noted, this increase likely reflects the in-migration of Latino workers and their families. This signature demonstrates that the availability of jobs in Trempealeau County is a factor in stabilizing its population. The migration signature for the county identifies two age sectors (*34 to 45 and 60+)* that should be monitored as indicators of the impact of mining on the county.

The movement of workers as they commute for jobs illustrates worker mobility in a region and is also an indicator of economic health. Worker migration data shows a 2014 snapshot of regional commuting. The rate of Trempealeau County resident workers who commute out of the county for jobs is 55%. The metropolitan counties of La Crosse and Eau Claire have significantly lower percentages of out migration.

Housing is a factor for worker migration. Workers may choose to live in a location where housing is more affordable, such as Trempealeau County, and commute to where jobs are located. The desirability of location is another reason why workers may live in one county and commute to work in another. La Crosse and Eau Claire counties have a zero percent net out migration of workers that indicates there is a closer match of the availability of housing and desirability of location with the availability of jobs.

Another indicator of economic health for a county is whether it is able to attract workers from nearby counties. This could be the case if a county has a surplus of jobs and serves as a magnet for workers in adjacent counties. The in-commuting rates for Eau Claire (64%) and La Crosse counties (73.8%) are the highest in the region. Trempealeau County is attracting 5,792 workers, an in-commuting rate of 44%. This inflow of workers is likely driven by the robust manufacturing industry located in the county.

Worker income is tied to commuting trends. In measurements of the flow of earnings, it is suggested that out-commuting workers bring their income home to the county. Conversely, in-commuting workers take their income out, to their county of residence. However, the strength of commercial centers in a county can alter this outcome. Because Trempealeau County has small and limited commercial centers, a significant of income portion from residents who are out-commuters is not being spent locally and is dispersed to the regional commercial centers in La Crosse and Eau Claire, Wisconsin, and Winona, Minnesota.

Summary

This report has identified relevant characteristics of Trempealeau County and the impacts of mining on community stability. Although NMISMs are relatively new to the county, sufficient evidence exists to indicate that the number and density of permitted mines could cause negative changes in population, employment and housing, and therefore disrupt community stability. The county is just beginning to experience the impacts of mining. Impacts will be amplified as the remaining

> ***"…communities have to be careful what tradeoffs they embrace as they try to expand their economies. Steps that undermine local quality of life can be economically counterproductive."***
>
> Power & Power, 2013b

permitted mines commence activity. Decreased community stability is associated with increased dependency on mining. If Trempealeau County increases dependency on mining, significant commitment and effort will be required to mitigate changes in housing and population trends. Many impacts, such as environmental degradation, could be irreversible.

The potential for significant disruption of community stability in the county dictates a cautious approach to increases in mining operations, and calls for the development of long-range strategic planning. Trempealeau County needs to decide whether it will be an amenity rich economy or an economy dependent on mining because the two options are not readily compatible.

Unbiased indicators of demographic and economic trends should be identified and monitored routinely (listed in recommendations). This investigation suggests that the rapid influx of mining will change the nature of Trempealeau County. A prudent approach would be to cease permitting additional mines until the county is able to monitor the actual costs and impacts of NMISMs, and to determine a long-term strategy to mitigate the negative impacts that will result when mining operations cease.

Hunting, fishing, and tourism in Trempealeau County reflect our rich amenities and can be impacted by NMISM.

Background

A significant part of the amenity package that Trempealeau County offers its residents and visitors is hunting, fishing, and other silent sport activities, particularly biking. What is the effect of the NMISMs on tourism, hunting and fishing in the county? Trempealeau County's successes are in part due to the abundant diversity that it has to offer to its residents and visitors. Trempealeau County's

diversity maximizes its natural beauty and includes two state trails, a state park, two county parks, many biking opportunities, and additional tourism opportunities.

Hunting and fishing are important to the county. Many streams in the county provide a great diversity of aquatic life and provide recreational fishing. The network of naturally occurring springs and cold-water streams provide water for many animals, including deer, birds, and aquatic life. This rich diversity of wild life, springs, streams and rivers provide a very important key component for maintaining a high quality of life. Trempealeau County trout streams are found on the "Trout Streams Map" in the maps section.

Key Finding 10

Violations from operating mines affect the natural environment.

Storm water violations cause dirty water, which is made up of water, dirt, sand, and in some cases chemicals, to enter the county's streams and rivers. This contaminated water escapes from NMISM operations, and runs off the hills and into the waterways leading into cold-water streams. This disrupts the biology of these cold-water streams. Freshwater streams are naturally cool and the water that is discharged from these retention ponds is much warmer than the waterways into which they flow. Examples of potential damage include the following:

1. The sediment sand washes over aquatic life such as eggs, burying them in the sand, resulting in death.

2. Aquatic life, such as trout, can only survive with a specific set temperature and pH in the stream. A healthy cold-water stream is typically around 21 degrees Celsius. The temperature is maintained by clean fresh water, which makes it a habitat for the diversity of life that lives within. When warm and dirty sand water runs and settles in these streams, changes occur within the natural environment.

3. As water, sand, dirt, and flocculants run off into streams oxygen levels decrease causing further death of aquatic life, due to the biology changes that take place in these circumstances.

These changes can be catastrophic for many of the fresh water fish, such as trout and other aquatic life. Fewer fish means fewer anglers, a decrease in the sale and purchase of fishing licenses, and less money going into the community.

Recognizing similar problems, Minnesota Trout Unlimited (MTU) adopted a position statement regarding NMISM (2012). While they clarified that they are not opposed to all sand mining in their state they want citizens and officials to understand the issues involved. They want to limit mining to areas where there will be little to no impact on water resources. MTU wanted to be clear that they are concerned about this precious resource in the present and for generations to come. The MTU position statement included restricting sand mining to above the water table, no on-site washing or sorting, no use of ground or surface water in mining operations, and no discharges into area wetlands, streams, and waterways (2012).

NMISM also impacts larger wildlife like deer. Blasting and light pollution impact animal populations (see the Water, Noise, and Light sections for a discussion on the impacts of these pollutants on humans). Unlike a family that is well established in an area and may not have the opportunity or means to move, wildlife will leave. Deer and other wildlife move out of these areas and into areas free of loud blasting and the bright lighting. Deer are nocturnal and have essential requirements in selecting their habitat. Deer look for dense cover for hiding, an area with maximum forage, and concealment cover for fawns. Light pollution alters and interferes with timing necessary for

biological activities in aquatic life, birds, and animals. Because the ecosystem is delicate, what will be the long-term ramifications of mining in the county?

Out-migration of wildlife and the loss of quality fishing opportunities will impact quality of life. Hunting and fishing is a long-standing tradition for many families, spanning back multiple generations. Related spending occurs at places such as community taverns, gas stations, grocery stores and restaurants. During hunting season, main streets are packed with vehicles, many with a deer carcass attached. If deer migrate to an area that is less stressful for them to live in, what will be the trickle-down effect? Hunting quality will go down, resulting in less money spent in the community, on hunting land leases, licenses, and other supplies. This has the potential to be significant. The Wisconsin Department of Natural Resources reported that total DNR spending for the fiscal year 2009-2010 was $474 million and license and stamp sales pay for over 67% of this cost. If license and stamp sales decline, how will the DNR's budget be impacted?

Key Finding 11

NMISMs could negatively impact the county's tourism economy.

While tourism is not a major part of the county's economy, it is growing and is built upon the amenities that make the county a desirable place to live. The Wisconsin Department of Tourism (2014) shows that direct visitor spending in the county increased from $21.4 million in 2011 to $22.2 million in 2013. The increase between 2011 and 2012 was 5.53%, which was higher than the state average increase of 5% (WDOT, 2014). Unfortunately, direct visitor spending in the county decreased 1.56% between 2012 and 2013 while the state average increase was 4.33% (WDOT, 2014).

A 2013 study on state park expenditures by Prey, Marcoullier, and Kim showed that the three main state recreational facilities located in the county alone generated $25 million dollars. Figure 7 shows the impact of each of these recreational areas.

2013 State park visitor and economic impact for Trempealeau County			
Site	**Visitors**	**Expenditures/visitor**	**Total Revenue**
Buffalo River State Trail	38,307	$131.78	$5,048,096.46
Great River State Trail	73,245	$87.34	$6,397,218.30
Perrot Park	317,519	$44.24	$14,047,040.56

Figure 7. Visitor and economic impacts in Trempealeau County (Prey, Marcouiller, and Kim, 2013).

A committee member met with Olin Fimreite to hear firsthand about local tourism, with additional detail on motor coach tours. The Trempealeau County budgets $4,500 for tourism that is divided three ways: bicycle tours, non-profit motor coach tours, and the tourism council. Each receives $1,500 for their budget. Fimreite designs the motor coach tours. Organized motor coach tours have been going on in Trempealeau County for 17½ years. In those years, 364 coaches and 14,277 tourists have toured the county. About 40% of the tours come out of the Minneapolis area. Each tour bus passenger completes an evaluation. The average rating for Trempealeau County is 9.17. The top rated attraction in the county is or scenic beauty. Motor coach tours may be impacted by the decrease in scenic beauty and increased truck traffic from mining operations.

Trempealeau County enjoys a national reputation as a destination for bicyclists across the country. A New York Times article wrote about “the twisting and hilly two-lane roads of Trempealeau County on the Mississippi River in southwest Wisconsin, bringing hundreds of bikers to pedal and coast

on terrain some call the best in the country" (Regenold, 2008). In another article, Furia (n.d.) talked about "…a new cycling nirvana in the Midwest…with velvety-smooth empty roads and rolling hills…"(Furia, n.d.). Bicyclists from around the country have been making the county a destination to experience our roads and scenic beauty. This aspect of tourism in the county is being impacted by the additional truck traffic associated with NMISM. A map of the bicycle loops is in the maps section. Additional information in the form of a local narrative on hotel tourism as it relates to NMISMs is in Appendix E.

Reclamation of mined land is a key concern and directly impacts the county's future land use and physical appearance.

Background

Reclamation of land following mining has yet to be fully studied in our area. Current mining operations have replaced many different uses of the land. Some mines have claimed prime agricultural land, others timber or marginal agricultural land. Many of the current mining permits have stated that land would be returned to productive agricultural land when reclaimed. Others have stated they would return this to recreational or pasture land. Questions have been raised regarding the ability of reclaimed mining land to return to sustainable, productive crop land as is promised.

In describing "reclamation" a basic understanding of definitions should be made. The National Academy of Science recognizes three categories of remedial land treatment: rehabilitation, reclamation, and restoration. With rehabilitation, the land is returned to a "form and productivity in conformity with a prior land-use plan". This includes a stable ecological state that does not contribute substantially to environmental deterioration and is consistent with surrounding aesthetics. With

reclamation, the site is “hospitable to organisms that were originally present or others that approximate the original inhabitants”. Finally, restoration replicates the condition of the site after the action to the condition of the site before disturbance (Toy and Lee, 1998). A general outcome is that industry supports rehabilitation, as it is the least costly; regulatory authorities favor reclamation; and environment advocates desire restoration. Pre-destruction decisions about intended post-mining land use must dictate which of these definitions is to be used.

Key Finding 12

Given environmental concerns, compliance with actual and stated post-reclamation usages needs to be monitored and verified.

Reclamation goals can run from as little as prevention of erosion with a cover crop to several year verification of productive cropland that does not result in pollution from attempts to amend and improve topsoil replacement. Stated specifically the goals include the following: compliance with laws and regulations; attainment of land-use objectives; and minimal long-term site maintenance. Complete reclamation plan components will address several steps to completion: material management; topographic reconstruction; topsoil replacement or substitution; surface manipulation; soil amendment; re-vegetation; irrigation; and site monitoring and maintenance (Toy & Lee, 1998). The types of agricultural land being lost to mining need to be identified and cataloged. Many of the current reclamation plans will not “restore” the property and are barely rehabilitation plans. This will result in the loss of what was once productive cropland. Further difficulties with land restoration have also been identified.

In one study, a comparison of crop yields was made between reclaimed land and un-mined land. Various techniques of soil amendments, deep ripping, no-till vs. conventional tillage and control

plots were used. Crop yields from treatment plots typically were reduced by 25 to 40% and the greatest one-time reduction was as high as 74% (Orndorff, Z., Daniels, W., Meridith, K., Alley, M., and Wick, A., 2011). The study was limited to a five-year time span. The reclaimed test plots were also irrigated when necessary to protect against crop failure.

A separate study looked more specifically at the effects of "stock piling" topsoil and the decrease in fertility over time. "Stockpiled soil became biologically unproductive after the sixth year. OC *(organic carbon)* and NPK *(nitrogen, phosphorus and potassium)* values came to a stagnant condition and microbial activity decreased to a minimum level" (Ghose, 2004). This is called the "shelf life" of the soil. When the shelf life was exceeded, substantial measures were required to return the soil to its pre-extraction status. Compaction of reclaimed areas was higher, which limited root penetration; and pH was lower due to leaching of cations (positively charged ions) during stock piling. If the shelf life of the soil is known mine planners can create more appropriate mining phase strategies. Direct haul reclamation, the removal of topsoil from one phase with direct application to another mine phase, is superior to stockpiling and should be used whenever possible. Toy and Lee (1998) recommend that stockpiles be limited in height and placed in well-drained areas to facilitate gas exchange. Their other recommendations are aimed at keeping the soil productive and protected so it can meet the needs of post-mining land use plans (Toy & Lee, 1998).

Holly Dolliver, Associate Professor of Geology and Soil Science University of Wisconsin-River Falls, is leading a five-year research project to determine how land could be reclaimed after mining. Research questions, pertaining to productivity of reclaimed land and whether the land should even allowed back to agricultural use, are included in the study.

Current permitting of Trempealeau County mines can result in removal of 60 or more feet of overlying sand that was previously a “filtration” system for the ground water. Without this protective layer, future applications of pesticides, herbicides and fertilizers can more easily and quickly seep into the ground water. The potential for serious contamination of major water aquifers could be substantial and should be further studied. Additional information on the impact on groundwater is in the water section of this report.

Monitoring and maintenance after reclamation should be ensured before any reclamation bond is finally released. This may require multiple years of crop rotation with continued ground water monitoring. Release of a reclamation bond after a cover crop is installed but before assurance of erosion stability needs to be avoided. By example, the Surface Mining Control and Reclamation Act of 1977 requires that reclamation programs for coal mines meet stringent standards for surface and groundwater quality, land form reconstruction, and long-term re-vegetation in conformance with pre-selected land-use objectives. In the eastern United States, the final reclamation bond is not released until the mine permit holder has shown the above standards have been met for five consecutive year; it is ten consecutive years for the western U.S. Early release of a reclamation bond before adequate monitoring has been completed would leave the county or city (in the case of annexed mines) responsible for mitigation of ground/surface water contamination or erosion problems.

Wisconsin Code, NR 135 Non-metallic mining reclamation deals specifically with groundwater quantity and quality. NR 135.08 (1) and (2) require that reclamation does not lower groundwater elevations or reduce the amount available for surface water or other groundwater users. It also requires groundwater quality standards be met. Compliance with NR 135.08 needs to be guaranteed

for a considerable time after reclamation is completed given the uncertainties of a new industry and potential catastrophic consequences (Wisconsin State Legislature, 2000).

TCDLM staff was asked by the sub-committee to determine what the current status of reclamation is in neighboring counties. Figure 8 below shows the comparison between the open acreage and the number of acres reclaimed. The data clearly indicates that reclamation is not currently being reported in Trempealeau County or much of western Wisconsin.

Figure 8. A Comparison of Acreage Currently Being Mined versus the Number of Acres Reclaimed in Four Counties in West Central Wisconsin

County	Conditional Use Permit Permitted Acres	Mineable Acres	Open Acreage 2012*	Reclaimed acres 2012	Open Acreage 2013	Reclaimed Acreage 2013
Trempealeau	5321	2975.86	268.2	0	104.8	0
Polk			688.7	16	721	2
Eau Claire	984.4 w/reclamation permit	578.4	167	0	247	0
Barron	160	4291	873.48	2.17	917.1	1.5
Chippewa	1967	5853	1772	69	1970	10
St. Croix	1196	615	22			

Note: For Trempealeau County the permitted and mineable acres are estimates because the exact number of acres annexed to communities is not known.

The results repeat and intensify the poor record of reclamation that occurs in Trempealeau County. In these counties, only 87.17 acres were reported as “reclaimed” in 2012, as compared to nearly 3800 acres open in that year. In 2013, only 13.5 acres were reported as “reclaimed”, as compared to over 3900 acres open in that year.

Annexation is impacting the development of NMISM and communities in Trempealeau County.

Background

The rate of annexation has increased six fold in the last four years (2010-2014) and at the time of this report at least three more annexations are under consideration. The ease with which cities can annex property contributes to the weakening of towns' property tax base and impacts the stability of rural communities.

Key Finding 13

The statutory basis for annexation is an effort to make community growth an orderly process.

Annexation is the method that incorporated areas like cities and villages use to increase their physical boundaries. It is the legal process that transfers property from a town to a city or village following the guidelines spelled out in current Wisconsin statutes (66.0223). The statutes are designed to attempt to create an orderly process for expanding community boundaries. The statutes specify the conditions that need to be met for annexation to occur. First, the land proposed to be annexed must be contiguous (touching) the city or village. Philip Freeburg, J.D., in "Annexation Basics," a training provided by the UW-Extension Local Government Center (LGC), stated that all annexations require a petition, an ordinance, a tax agreement with the town, notices to relevant officials at the state and local levels, and "asset and liability apportionment"(p. 8). In counties with a population over 50,000, the Department of Administration (DOA) will provide a public interest opinion. While such an opinion is not required in smaller counties, town boards can request such an opinion from the DOA.

There are three common types of annexation. The first, most common, is unanimous consent direct annexation. With this method, Freiburg noted that all of the property owners impacted and all

the electors (voters) in the proposed territory must sign the petition that is filed with the city or village, the town, and the school district (2014a, p. 13). The second method is a direct annexation by one-half approval (2014a, p.19). Freiburg indicates that this method doesn't require "resident electors;" half of the land owners or the owners of half of the assessed property value can petition for annexation (2014a, p. 19). The third major form of annexation, according to Freiburg, is annexation by referendum where the petition must be signed by a number of voters that represent 20% of the votes in the last election for governor and half of the landowners in the proposed area or the owners of half of the real property value (2014a). There are some other methods, but they are generally less common.

There are a couple of important issues to point under the statutory basis for annexation:

- Land owners initiate the process.
- The incorporated community can only say yes or no to an annexation request.
- Towns have no standing to oppose the annexation unless they request a public interest opinion from DOA. They can only pursue the issue in court if the DOA's official opinion is that the annexation is not in the public's best interests. This step is optional in Trempealeau County since our population is under 50,000.

Key Finding 14

Annexations are expected to meet a public interest standard when reviewed by the Department of Administration.

Annexations in counties with a population under 50,000 are not required to be reviewed by the Wisconsin Department of Administration; however, a town can request a review, which is necessary if the town intends to legally challenge the annexation. As Freiburg notes in Boundary Basics the review

looks at tax revenues and the impact on the rest of the town (2014b). Are services better supplied by the city or village than the town? Is zoning more effective at the city or village level? What happens to the city or village with the annexation? How is existing service levels affected? Freiburg also discusses the concept of "reasonable need" (2014b). This concept is about how the annexation allows for logical growth of the community considering needs for residential or industrial areas or a need to extend services to avoid pollution (2014b). Freiburg also notes that "inducements [must be] absent (2014b).

Key Finding 15

The nature of annexation in Trempealeau County has changed over the past ten years.

The annexations that occurred in Trempealeau County from January 22, 2004 through May 14, 2014, were reviewed by Tim Zeglin, Trempealeau County Board Supervisor and committee member, to see if any changes in the pattern of annexations could be seen. This chart was compiled from public records located at the Trempealeau County Registrar of Deeds office. Figure 9 is a summary of this research where the records showed the amount of land annexed.

Forty annexations were recorded in this 10 year time frame. Twenty-five percent of these annexations have occurred in the past two years. Over the past decade the average acres per annexation was 76.123 acres (of those recording the number of acres annexed). The average number of acres annexed in the past two years has been 239.413 acres. Compare local results with an analysis of annexations statewide over the past 17 years. Nacker states that the average size of an annexation has been "just over 46 acres" during the 17 year period he reviewed (2005). County annexations are larger than the state average and have increased over 300% in size over the past two years.

There are some patterns to note from a review of the data:

- Forty percent of all annexations during this period that recorded zoning were zoned residential.
- Ten percent of all annexations during the past two years were zoned residential.
- Just over 25% of all annexations during the 10 year period were zoned industrial.
- Forty percent of all annexations were clearly zoned industrial. The number actually designated to be used for mineral extraction is probably higher because communities use different names for zoning categories.

Figure 9. Trempealeau County Annexations from 1/22/2004 to 5/14/2014.

DATE RECORDED	ANNEXED TO	REMOVED FROM	ACRES	ZONED
1/22/2004	Strum	Town of Unity	2.262	Residential
6/15/2004	Galesville	Town of Gale	3.23	Residential
7/19/2004	City of Arcadia	Town of Arcadia	10.33	Residential
7/13/2005	Village of Trempealeau	Town of Trempealeau	77.57	Residential
8/21/2006	City of Arcadia	Town of Arcadia	8.198	Industrial
8/21/2006	City of Arcadia	Town of Arcadia	15.77	Commercial
8/24/2006	Village of Trempealeau	Town of Trempealeau	69.26	Residential
12/27/2006	Village of Trempealeau	Town of Trempealeau	7.57	Commercial/Residential
12/27/2006	Village of Trempealeau	Town of Trempealeau	0.90	Street Construction
2/27/2008	City of Arcadia	Town of Arcadia	~3	Industrial
4/2/2008	Independence	Town of Burnside	2.61	Residential
4/17/2008	Strum	Town of Unity	~25	Update from 1958
3/24/2009	Village of Trempealeau	Town of Trempealeau	0.25	Well
11/17/2009	Blair	Town of Preston	8.22	Industrial
1/7/2010	Village of Trempealeau	Town of Trempealeau	1.4	Residential
5/13/2010	City of Arcadia	Town of Arcadia	2.662	None listed
6/18/2012	Strum	Town of Albion	19.67	Sewage Facility
5/13/2013	City of Arcadia	Town of Arcadia	27.76	Agricultural
11/20/2013	Strum	Town of Unity	9.05	Residential
11/21/2013	Independence	Town of Lincoln	~700	Industrial
11/21/2013	Independence	Town of Lincoln	~40	Industrial
12/17/2013	Whitehall	Town of Lincoln	~640	R District (Provisional)

Note. The data in Figure 9 was compiled from records at the Trempealeau County Register of Deeds office.

Key Finding 16

Municipal rules and regulations will change when land is annexed.

Municipal jurisdiction in annexed properties in Trempealeau County remains uncertain and problematic. Nacker notes that sewer, water, and transportation are "required improvements for residential, commercial and industrial development" (2005). New citizens may also expect police, fire, and emergency services. They must also be provided with new fire identification numbers, and be registered in already-established wards of the city or new wards. Freiburg notes the transition from rural to urban is "traumatic" (2014b). Local officials need to adjust the tax base; the personnel serving citizens change; and cities need to adjust ordinances and plans (2014b).

When communities annex land that includes NMISM, the county's non-metallic mining ordinance remains in place unless, according to a communication with Brian Ohm, J. D and professor in Urban and Regional Planning at UW-Madison, the city adopts a non-metallic ordinance that meets DNR requirements (Ohm, August 22, 2014). Sand-mined acres within city boundaries are supposedly administered by the Wisconsin Department of natural Resources (WDNR), which typically delegates "lateral" regulatory authority to the city. (Kevin Lien, personal communication, 21 July 2014). In Trempealeau County, these cities have so far always hired private engineering firms to oversee and to report on compliance with "reclamation plans."

Ohm also points out the authority of the County's Public Health Department remains to enforce ordinances and rules to protect the public from risks from polluted air or groundwater (August 22, 2014). The county highway department retains its authority to permit new access to county roads or to impose weight limits (August 22, 2014).

Key Finding 17

Annexation's impact on municipal property tax revenues will vary.

Annexation is the main method incorporated communities use to grow their municipal boundaries. Nacker points out that annexation is used to deal with population growth; as the population grows people need homes, businesses, and services (2005). Annexation is driven by landowners. They request annexation because they feel the incorporated community is able to provide some needed services. Although not required to say yes to annexation, it is, for all practical purposes, the only way a city or village can grow.

The Wisconsin Realtors' Association (WRA) in a fact sheet on annexation notes that although the city and residents receive advantages, there are potential disadvantages from annexation. The WRA lists these as 1.) New residents who may not want city services will face an increase in property taxes; 2.) There will be a loss in the rural character of the area; and 3.) The city ordinances and regulations are likely to be more restrictive (n.d.) One practical example of this shared during the focus groups involved deer hunting. If city ordinances ban the discharge of guns within municipal boundaries farmers who have been incorporated into the city may no longer be allowed to hunt on their land or control the deer population to protect their crops.

The annexation increases the amount of property tax available for cities and villages to provide services all things being equal. At the same time, property tax revenues in the town impacted by the annexation will decline after a five year period. For the first five years following annexation, the city or village must pay the town the property tax the annexed land would have generated. The impact on property taxes for the county should generally be positive if the value of the annexed land increases

because its assessed value increases, and the county will receive increased property tax revenues (personal communication with Ohm, August 22, 2014).

Key Finding 18

Annexation is contributing to the destabilization of communities in the county.

Annexations in the county have generally been small, which resulted in incremental growth in incorporated communities. These annexations, up until the past two years, have largely been to acquire residential land, develop an industrial park, or to put in new services such as a well or sewage treatment plant. The annexations that have occurred over the past two years have been to acquire large amounts of largely open land for the purpose of NMISM.

Community residents are feeling the impact as revealed in the focus group study conducted by Malone. The majority of participants spoke at great length about the negative impact annexation is having. For some, the issue is the loss of future tax revenue for the towns and a concern over the impact the annexations are having on school aids or could have on school aid. Others feel that annexation has no benefit for the towns losing land, “What’s in it for the towns when they are annexed?” Others are more concerned about the cities, “I don’t think city officials know what they are getting into.”

The reactions ranged from very mild, “I don’t agree with the way the sand mines circumvented county rules… The revenue and the jobs are great, but I don’t like how it got here.” Some reactions were very forceful and demonstrated a high level of frustration, “Annexation is a complete scam. It’s a deliberate attempt to hoodwink us.” People are quite concerned about additional costs that taxpayers

living in cities may now have to pay. Others are concerned that city officials are not planning for the future. A few participants spoke about annexation as a strategy to get the level of government with the least amount of experience to deal with the sand mines.

The sand mines received mixed reviews. The perspectives of participants varied from community to community. Some mines were seen as good corporate citizens who have donated to emergency services and community projects. They "came through" with their promises. Other mines were seen as essentially trying to bribe communities to annex them. Some describe the companies as coming with "wheelbarrows of money." To quote one participant, "It's been a mess."

Tax valuation and equalization will be impacted by NMISM.

Background

Property tax revenues have a significant impact on the stability of communities. Communities need adequate revenues to fund needed and desired services such as roads, education, and police protection among other things. The impact of NMISM on property tax revenues and equalized valuation has been a subject of much debate. Unfortunately, detailed information about the impact of NMISM on property taxes and equalized values is limited due to the fact the industry is relatively new in the county. There are some facts that are known.

Key Finding 19

Land parcel values are lost by towns when the parcels are annexed to a city or village.

Key Finding 20

Wisconsin's school funding formula is based on student enrollment and equalized valuation in the district.

Key Finding 21

School districts with higher equalized valuation receive less state aid (e.g., Blair-Taylor School District lost $500,000 in state aid in 2013 and $300,000 in 2014). Increases in student enrollments will increase state aids.

Key Finding 22

A decrease in school state-aid is an added cost to local taxpayers unless there is an increase in student enrollments.

Key Finding 23

The financial impact of NMISM on school districts has largely been left out of the debate on NMISM in the county.

NMISMs are a relatively new industry in Trempealeau County therefore value of properties in the areas of NMISMs has neither shown a drop or rise in value. There is no clear local evidence due to the lack of enough arms-length sales. It may take a number of years or an increase in the number of sales to determine the impact on property values. There is data, however, that suggests home prices will be impacted. A 2013 study by Parker and Phaneuf looked at the impact of noise and rail traffic on home values. Parker and Phaneuf show that homes exposed to noise levels ranging from 55 decibels (dB) to 70 dB sell for prices 2.3% to 5.1% lower than comparable homes (2013). When Parker & Phaneuf (2013) looked at homes within 750 feet of rail lines they saw prices drop 5% to 7%. If this work is applicable to the county the survey conducted by Malone (2014) would suggest that traffic and noise could impact home values. The study had about 67% of respondents within a half mile of their home indicate an increase in heavy truck traffic in the last three years (2014). Malone also found that about 47% of respondents said outside noise heard inside the home had increased over the same period of time (2014).

NMISM processing plants in a school district can greatly impact equalized values. For example, Blair-Taylor School District's equalized valuation increased roughly $31 million in 2013. NMISMs are

increasing equalized values in the Arcadia School District as well. The tax base scenario is one that had not been explored by industry leaders or taxpayers until new district-wide property value assessments came in.

Summary

Residents of Trempealeau County place a high value the natural beauty and small town/rural atmosphere of the county, as documented in the comprehensive plan. NMISM operations do not fit with these aspects of quality of life as identified by county residents. The appearance and valuation of housing is negatively impacted by development of mines in a rural area. The top items identified in the "Quality of Life" section seem to conflict with the large scale mining we see entering this county. Reclamation of mines and returning them to "productive" cropland has yet to occur.

An increased dependency on mining for jobs and economic vitality could reverse the current increases in economic growth and per capita incomes in the county. The county is currently attracting a significant number of workers, but if communities are unable to capture their income as residents or as consumers earnings will continue to flow out from the county. As the amenities that make our county valuable as a place to live and work are lost, Trempealeau County will bear full responsibility for the costs of the necessary infrastructure to support the NMISMs industry located in the county, even though it will not receive the full benefits of that industry. The benefits will leak out to other regional and national economies. Planning can play a critical role in minimizing negative outcomes. Towns, cities, villages, and the county government should make decisions that reflect the results of their comprehensive plans. The following chapters will more specifically address ambient air quality, groundwater and surface water issues, light pollution, noise pollution, and radon and radiation.

However, the Stable Communities subcommittee makes the following recommendations to minimize negative impacts on the people, organizations, businesses, and local governments in Trempealeau County:

Recommendations

SC1. Enact a county-wide long-range strategic planning process that includes the development of a vision to help guide county policymakers. The plan should address the changes the county and its communities are facing and develop strategies to manage the cyclical nature of NMISM and to mitigate the negative impacts that will result when mining operations cease.

SC2. Monitor key socioeconomic indicators on a regular basis. The review of the indicators can serve as the basis for a discussion of how community stability is being impacted and if further action needs to be taken. The committee worked with the Applied Population Lab at UW-Madison to identify the following indicators:

- The number and income of county residents working in county-based mines
- County-wide labor trends
- County migration patterns
- Per capita income
- Unemployment rates
- The demands for public health services and their related costs
- The value of owner-occupied housing
- The number and location of new dwellings

SC3. Track all fishing and hunting licenses sold in the county to determine if mining is causing changes in licenses sold.

SC4. Modify ordinances to limit the number, expansion and locations of mines. This would allow for the protection of the natural beauty, drinking water and environment that is identified in the current comprehensive plan.

SC5. When the comprehensive plan is updated, land use patterns of NMISMs and related information of interest to the public should be included.

SC6. Track bicyclist numbers and organized rides to determine if mining has a negative effect on the number of bicyclists and related tourism that occur in the county.

SC7. Designate “Scenic Beauty” highways and other areas where mining cannot commence. This should be done to protect the natural landscape that is highly valued by residents and visitors.

SC8. Conduct an economic impact analysis of the deer-hunting season in Trempealeau County.

SC9. Request the Wisconsin Department of Natural Resources to track animal (i.e. deer, turkey) migration patterns in areas where blasting and light pollution occur, and evaluate the effect on animal populations.

SC10. Tighten reclamation plans to have fewer acres open at one time, as well as shorten the amount of time these mined areas can be open.

SC11. Compare the intended post-reclamation land uses to the total acres lost and the pre-mining land uses. The area reclaimed should at least equal the number of acres mined. Post-reclamation land uses should be compatible with pre-mining uses and municipal comprehensive plans.

SC12. Monitor the maintenance of “reclaimed” land for at least five years before release of the reclamation bond is made. Assurance of surface and ground water quantity and quality must be guaranteed. Longer time frames may be necessary based upon outcomes of current reclamation studies being conducted.

SC13. Conduct research on reclamation in Trempealeau County similar to the one currently being conducted by UW-River Falls in Chippewa County. Funding for the study should come from permit holders.

SC14. Pass a resolution condemning the use of “balloon on a string” annexations.

SC15. Encourage towns to attempt cooperative boundary planning (authorized under s. 66.0307) with their urban neighbors to minimize the impact annexations are having on towns and cities in Trempealeau County. The Town of Lincoln is currently participating in this process with the City of Whitehall.

SC16. Encourage town officials to apply for a DOA public interest opinion when an annexation is proposed cooperative boundary planning has not worked.

SC17. Adopt a resolution supporting state legislation that would prohibit annexations in which more than 50% of the annexed area extends farther than ¼ mile away from existing city limits at the time of annexation.

SC18. Monitor property sales close to NMISMs to determine if there are any changes in sales and property values over the next 10 to 20 years.

SC19. Monitor public resources (i.e., tax revenues) being used to maintain sufficient infrastructure.

SC20. Conduct on-going research looking at the following issues:

- Town strategies to increase public resources (i.e., tax revenues) to offset property value loss of annexed land parcels.
- Impact on the tax base of the reclaimed land.
- Land value of the reclaimed land.
- Tax impacts on residents of cities/villages who have annexed NMISMs.
- NMISM tax contributions to local units of government including total revenue and share of total revenue.

SC21. Increase the permit application fees on mining permits to cover the added expenses of the above recommendations.

SC22. Cease permitting additional mines until the county is able to monitor the actual costs and impacts of NMISMs as outlined in these recommendations.

References

Applied Population Lab. (2013). *A New Set on Estimates on Net Migration. Populations Notes: A look at the demography and geography of Wisconsin.* Retrieved from http://www.apl.wisc.edu/newsletters/Population_Notes_Summer2013.pdf

Applied Population Lab. (2014a). *Latinos in Wisconsin: A Statistical Overview.* Retrieved from http://www.apl.wisc.edu/publications/Latino_Chartbook_2010.pdf

Applied Population Laboratory. (2014b). *Trempealeau County Latino Population Brief. Basic demographic characteristics and changes in the Latino population of Trempealeau County.* Retrieved from http://www.apl.wisc.edu/latino_briefs/Trempealeau_County_Latinos.pdf

Applied Population Laboratory. (2014c). *Demographic profiles of areas within 1, 5, 10, and 25 miles of five operational mines in Trempealeau County.*

Berard, D., Chapin, S., Hoogasian, A., Kane, T., Marcouiller, D, and Wojciechowski, T. (2014). *The Economic Impacts of Active Silent Sports Enthusiasts: A Case Study from Northern Wisconsin.* Retrieved from http://urpl.wisc.edu/people/marcouiller/publications/ER14.1SilentSportsl.pdf

Census Reporter. (n.d.). *Trempealeau County, WI.* Retrieved 2014, from http://censusreporter.org/profiles/05000US55121-trempealeau-county-wi/

Davies, P. (2012). *Sand Surge.* Retrieved from https://www.minneapolisfed.org/publications_papers/pub_display.cfm?id=4921

Deller, S. (n.d.). *Economics Multipliers.* Retrieved from http://wcwrpc.org/Frac_Sand/Economic/UWEX-Economic-Multipliers.pdf

Deller, S. (2014). *The Community Economic Impacts of Mining.* Retrieved from https://www.wicounties.org/uploads/legislative_documents/steve-deller-wca-economics-of-mining-for-wca.pdf

Deller, S., & Schreiber, A. (2012). *Frac Sand mining and Community Economic Development. Staff Paper No. 565.* Retrieved from http://www.aae.wisc.edu/pubs/sps/pdf/stpap565.pdf

Freiburg, P.J. (2014). *Annexation basics* (Wis-line presentation). Available from UW-Extension Local Government Center.

Freiburg, P.J. (2014). *Boundary basics* (Wis-line presentation). Available from UW-Extension Local Government Center.

Furia, E. (n.d.). The Perfect Getaway. *Bicying.com.* Retrieved from http://www.bicycling.com/ride-maps/featured-rides/perfect-getaway

Ghose, M. (2004). Effect of Opencast Mining on Soil Fertility. *Journal of Scientific & Industrial Research.* 63, 1006-1009.

Headwaters Economics. (2014). *A Profile of Socioeconomic Measures Benchmark Geographies: United States.* Retrieved from http://headwaterseconomics.org/wphw/wp-content/uploads/print-ready-measures-pdfs/55121_Trempealeau-County_WI_Measures.pdf

Malone, P.L. (2014).*Report on the final results of the citizen survey on the impacts of industrial sand mining in Trempealeau County.* UW-Extension Trempealeau County.

Millis, P. (2014). *Annexation proposal packet submitted to the City of Arcadia.*Weld, Riley, Prenn & Ricci, S.C.

Minnesota Trout Unlimited. (2012). *MNTU Adopts Positions Staement Concerning Silica Sand Mining*. Retrieved from http://mntu.org/mntu-adopts-position-statement-concerning-silica-sand-mining/

Mississippi River Regional Planning Commission. (2013a). *County Profiles, Trempealeau County Housing Trends.* Retrieved from http://www.mrrpc.com/Trempealeau_County/Trempealeau_County_Housing_Trends.pdf

Mississippi River Regional Planning Commission. (2013b). *County Profiles, Trempealeau County Population and Population Projections.* Retrieved 2013, from http://www.mrrpc.com/Trempealeau_County/Trempealeau_County_Population_Trends.pdf

Mississippi River Regional Planning Commission. (2013c). *County Profiles, Trempealeau County Quick Facts.* Retrieved from http://www.mrrpc.com/Trempealeau_County.html

Mississippi River Regional Planning Commission. (2014). *Economic Overview 2014-1st Qtr.* Retrieved from http://www.mrrpc.com/Misc_pdfs/EMSI_Trempealeau_County_Summary_Report.pdf

Nacker, R.M. (2005). *The economic development impact of annexation*. Wisconsin Economic Development institute, Inc. Retrieved from http://www.wi-edi.org/docs/Annexation_Report.pdf

Nadreau, D. H., & Robison, T. (2013). *The Economic Impact of Frac Sand Mining A Look at Jobs and Earnings in Wood County, WI.* Retrieved from http://marshfieldchamber.d2hosts.com/wp-content/uploads/2013/12/Final-Report-Frac-Sand-Impact.pdf

Orndorff, Z, Daniels, W., Meridith, K., Alley, M., & Wick, A. (2011). *Effects of Prime Farmland Soil Reconstruction Methods on Post-mining Productivity of Mineral Sands Mine Soils in Virginia.* Retrieved from http://landrehab.org/UserFiles/DataItems/7A5A565056467179483555 3D/Orndorff%20et%20al.,%202011%20ASMR%20Effects%20of%20prime%20farmland.pdf

Parker, D. & Phaneuf, D. (2013). *The Potential Impacts of Frac Sand Transport and Mining on Tourism and Property Values in Lake Pepin Communities.* Retrieved from http://www.sandpointtimes.com/pdf/

Prey, J., Marcouiller, D., and Kim, D. (2013). *Economic Impacts of the Wisconsin State Park System: Connections to Gateway Communities* (Report No. PR-487-2013). Retrieved from http://dnr.wi.gov/topic/parks/documents/wisc_st_parks-econ_report_2013_final_web.pdf.

Power, T. & Power, D. (2013a). *The Economic Benefits and Costs and Costs of Frac-Sand Mining in West Central Wisconsin: Phase One of Study – General Economic &*

Community Overview. Retrieved from http://www.iatp.org/documents/the-economic-benefits-and-costs-of-frac-sand-mining-in-west-central-wisconsin

Power, T. & Power, D. (2013b). *The Economic Impacts of Renewed Copper Mining in the Western Upper Peninsula of Michigan.* Retrieved from http://www.savethewatersedge.com/the-economic-impacts-of.html

Regenold, S. (2008, August 28). On a Roll in Wisconsin. *New York Times.* Retrieved from http://www.nytimes.com/2008/08/29/travel/escapes/29Trempealeau.html?module=Search&mabReward=relbias%3Ar

Toy, T. & Lee, D. (1998). Reclamation of Disturbed Lands. In the *Encyclopedia of Environmental Analysis and Remediation.* (pp. 4078 – 4101). Hoboken, NJ: Wiley-Interscience.

Trempealeau County Department of Land Management. (2009a). *Comprehensive Plan for Trempealeau County.* Retrieved from http://www.tremplocounty.com/landmanagement/Planning/COMPLETE_COMPREHENSIVE_PLAN.pdf

Trempealeau County Department of Land Management. (2009b). *Planning.* Retrieved from http://www.tremplocounty.com/landmanagement/Planning/planning_Home.htm

Trempealeau County Department of Land Management. (July 2014). *Mine Information.* Retrieved from http://www.tremplocounty.com/landmanagement/MineInfo_Pub.htm

US Census Bureau. (2013). *State and County Quick Facts. Trempealeau County, WI.* Retrieved from http://quickfacts.census.gov/qfd/states/55/55121.html

Wisconsin Department of Administration. (2013). *Population Projections by Sex and Age 2010-2040, Wisconsin Counties, Final Release.* Retrieved from

http://www.doa.state.wi.us/divisions/intergovernmental-relations/demographic-services-center/projections#preliminary

Wisconsin Department of Tourism. (2014). *The Power of Wisconsin Tourism: Economic Impact Fact Sheet*. Retrieved from http://industry.travelwisconsin.com/research/economic-impact

Wisconsin Realtors' Association. (n.d.) *Annexation*. Retrieved from https://www.wra.org/Annexation/

Wisconsin State Legislature. (2000). *Nonmetallic Mining Reclamation.* Retrieved from https://docs.legis.wisconsin.gov/code/admin_code/nr/100/135/II/08

Workforce Connections. (n.d.). *Frac Sand MIning Industry Report.* Retrieved from http://wcwrpc.org/Frac_Sand/Economic/frac_sand_mining_industry_report_21112.pdf

Water

Water Quality Sub-committee Members: Dr. Sarah Slaby (chair), John Aasen, Sherry Rhoda, and Lois Taylor

Background

Water is a vital element for life. It is integral to quality of life as well. Groundwater is the source of drinking water for both municipal and private wells in Trempealeau County. It is the general expectation that adequate amounts of safe drinking water be consistently available.

Surface water is synonymous with rivers and streams. Streams and rivers feed the Mississippi River facilitating commerce. These systems provide wildlife habitat and support local tourism and recreational activities for visitors and residents.

There are a number of public health concerns related to groundwater and surface water. They include an adequate supply of potable water; sustainable water use, and the environmental impact of chemicals used in the mining process.

Groundwater Background

Trempealeau County draws on two aquifers to provide groundwater for all uses. In the southern end of the county and along rivers, groundwater is supplied by the sand and gravel aquifer. Although the yield is adequate in this aquifer, it is generally more vulnerable to contamination because the materials are quite coarse and the water moves through them rapidly. The Cambrian aquifer (a sandstone and dolomite aquifer) is the primary aquifer in the county.

Key Finding 1

Groundwater in Trempealeau County is susceptible to contamination.

A review of a map produced by the Wisconsin Department of Natural Resources (DNR) and the Wisconsin Geologic and Natural History Survey (WGNHS) shows that the majority of groundwater is moderately to very susceptible to contamination (1989). The most susceptible areas are along the Trempealeau River, the Buffalo River, and the southwest part of the county in the towns of Trempealeau, Dodge, and Caledonia (WGNHS). There are five physical factors that significantly determine how susceptible groundwater may be to contamination. They include the following: type of bedrock, depth to the water table, soil characteristics, and the characteristics of deposits on the surface. WGNHS states that soil and surficial deposit characteristics are "the most important factors" in determining susceptibility (1989). Soil is the first barrier water passes through on its way to the groundwater table. Shallower, coarser soils do not provide the same protection that heavier, thicker soils provide.

Key Finding 2

Groundwater quality varies throughout Trempealeau County.

The county generally has high quality groundwater. The Arcadia municipal water supply has won national awards for water quality. When people drill a well in the county, they can generally expect an adequate amount of safe water. There are exceptions. A report by the United State Geological Service (USGS) indicated that 11% of wells throughout the county tested between 1990 and 2006 exceeded the nitrate drinking water standard of 10 mg/l (2008). The same review indicated that 35% of the samples had nitrate levels between 2 mg/l and 10 mg/l (2008). Nitrate occurs naturally in groundwater at levels under 2 mg/l. Nitrate levels are a good indicator of whether or not human activities are affecting groundwater quality. Once levels start rising above 2 mg/l, it is generally an indication that human activities are starting to impact water quality. Although the USGS study looked at well tests from throughout the county, there are areas where high nitrate levels are

common. Over 46% of the wells tested at a screening program conducted in the towns of Trempealeau and Caledonia exceeded the nitrate health standard (Patricia Malone, personal communication, August 15, 2014).

Nitrate is not the only contaminant. A 2002 study indicated that over 50% of the wells in the west central region of Wisconsin that includes Trempealeau County contained detectable levels of a pesticide or a pesticide metabolite (2008). Arsenic naturally occurs in soil, bedrock, and groundwater. The Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) created atrazine prohibition areas banning the use of this pesticide in areas where it has been detected in private wells. Over 2500 acres in Trempealeau County have been placed in atrazine prohibition areas (2008). Arsenic has been detected in private wells in every county in Wisconsin (2008). Traces of arsenic are also found in lakes and rivers and fruits and vegetables. Inorganic arsenic, which is the most toxic form, has been found in hundreds of private drinking wells of Wisconsin (2008). A map of groundwater susceptibility is provided in the maps section. It is from the 2008 USGS report.

Key Finding 3

Groundwater is expensive to clean.

Prevention of contamination is a critical strategy when protecting groundwater. The nature of groundwater makes it very difficult to clean once it is contaminated. Unlike a spill in a river, a plume of contamination can take years or decades to travel through an aquifer. Treating polluted groundwater so it is potable can be prohibitively expensive. Russell notes that some contaminants, such as acrylamide, cannot be removed by conventional treatment systems (2013). Another example of the costliness of cleanup is the USGS' report that indicated that by May, 2007, over $8 million had been spent to clean up 72 petroleum contaminated sites in Trempealeau County (2008). One strategy that has been promoted to protect municipal well water quality is the adoption of wellhead protection plans and ordinances. Eight municipal water systems in Trempealeau had wellhead protection plans in place by 2006 (USGS, 2008). Five of these communities (Arcadia, Ettrick, Galesville, Independence, and Trempealeau) also have wellhead protection ordinances on the books.

Key Finding 4

Trempealeau County has sufficient groundwater to meet current demands, but demand is increasing.

USGS in a recent estimate of recharge rates estimated the annual recharge in Trempealeau County at 8 inches to 8.9 inches (Gebert, Walker, & Hunt, 2011). The aquifers supplying well water in the county generally provide a sufficient yield to meet the demands of the users, however the demand is increasing. A recent USGS report indicated that Trempealeau County groundwater use had grown from 3.06 million gallons per day to 10.87 million gallons per day in 2005 (2008). In their report on Wisconsin water use, the DNR noted that total groundwater withdrawals grew 69% between 2011 and 2012 in Trempealeau County (2012b). Statewide, agricultural irrigation and municipal public water are the biggest users of groundwater (DNR, 2012b). The same DNR report indicates that industrial uses accounted for only 3% of total groundwater withdrawals statewide (2012b). A review of DNR records by Malone in 2013 found 184 high capacity wells approved in Trempealeau County (Patricia Malone, personal communication, May 15, 2014). Malone indicated that about half of these wells were agriculture related. Ann Hempl, at the request of the Health Impact Study – Moratorium Committee mapped the high capacity wells in the county (See maps section). “Although agriculture is our largest groundwater user, we are seeing an increase in high capacity wells drilled for NMISMs. About one-third of the wells permitted since 2010 have been for sand mine operations,” said Malone in a communication with the committee (personal communication, Patricia Malone, July 28, 2014). Even officials at the highest levels are recognizing the emerging concern over issues of groundwater quantity. President Obama issued Executive Order #13514 (October 5, 2009) in order to address regional water budget issues.

Key Finding 5

NMISM can impact groundwater quality.

NMISM has the potential to impact groundwater through a variety of activities. Water at a mining site is used to control dust, process sand, and meet the needs of workers. There are a number of ways a mine can

impact groundwater. One way is through the chemicals used in the processing of sand. Wastewater discharge, storage, and handling of chemicals can all impact groundwater quality (DNR, 2012a).

Polyacrylamide (PAM) is commonly used to dewater treated sewage sludge at water treatment plants. PAM is used as a flocculant at NMISM plants in processing sand to remove impurities while washing the sand to improve the recycling of water, and reduce overall water demand and the need for settling ponds. However, a concern expressed by many individuals is about those flocculants. Actually, depending on the concentration and the type of the flocculants used, they can pose a risk to water quality.

The research conducted by the USDA (United States Department of Agriculture) shows that anionic (negatively charged) PAM is water and food safe with no known toxicities in soil and water, when present at levels less than 10ppm (2008). The USDA research goes on to show that cationic (positively charged) PAM is more dangerous to fish through suffocation and aquatic toxicity; PAM's molecule is too large to be absorbed into cells and tissues (2008). In addition, USDA has found that PAM absorbs solids quickly and is irreversibly absorbed upon drying, with a field -retention of 97-99% (2008). Finally, USDA notes that PAM removes itself from runoff via adsorption, with a subsequent loss of 1-3% (2008).

Degradation occurs initially under ultraviolet light, then further by microbial activity. Once anionic PAM is naturally broken down and biodegraded, it does not persist or accumulate in the environment (Lentz, Andrawes, Barvenik, and Koehn, 2008). Under best conditions, its half-life is 48 hours.

Erosion PAM does contain less than 0.05% of a monomer considered to probably be a human carcinogen known as acrylamide (AMD). A concentration with a National Primary Drinking Water Regulation of 0.5 µ/L is thought to be safe. The maximum containment level goal (MCLG) for acrylamide is zero because even short- term exposure can cause significant problems (Barr, 2013; Russell, 2013).

When PAM degrades to the monomers AMD and sodium acrylate; they also degrade aerobically at 90% within 28 days. According to SNF/Floerger, "Even if doses as high as 50mg/liter of residual monomers are released into the environment, it will never reach concentrations which constitute a risk to aquatic life, (because) their high biodegradability negates the possibility in the natural environment" (n.d.).

AMD is readily transported and dissolved in flowing water, making the risk to ground water beneath the anionic water soluble PAM contamination minimal (Lentz, Andrawes, Barvenik, and Koehn, 2008). From a precautionary principle perspective, the World Health Organization reports that AMD may potentially contaminate groundwater. PAM degradation in a 6 -week USDA study, demonstrated no change in pH with released AMD at one molecule/20,000 units at a temperature greater than 95 degrees C. (203 degrees F.) (Lentz, Andrawes, Barvenik, and Koehn, 2008). AMD, like PAM, is known to be biodegradable but it does not bind as well to soil and can move rapidly through the soil column especially in the sandier soils common with NMISM (Russell, 2013). Further, as noted by Russell and Barr Engineering, there are no current EPA approved methods of testing for acrylamide nor can conventional water treatment processes remove it (2013). Where water treatment operations use PAM that may have acrylamide contamination, the EPA uses a requirement that limits the allowable acrylamide to 0.05 percent by weight; the dosage that can be added to raw water is 1 mg/l (Russell, 2013).

Mining changes the surface of the land and through these changes can impact the local hydrogeology. Effects will be site specific. If an operation mines below the water table they must de-water the mine. This will greatly increase the amount of groundwater withdrawn from the site. This impacts the groundwater flow and elevations. The DNR states that the majority of NMISM operations permitted in Wisconsin do not mine below the water table (2012a). The pumping associated with high capacity wells will create a cone of depression. Neighboring wells may see a lowering of the water table during times of high demand and low recharge. If the

groundwater is discharging to local streams and rivers the DNR notes the potential change in groundwater flow may impact stream levels and wildlife habitat (2012a).

Key Finding 6

Blasting is impacting wells in Trempealeau County.

NMISMs may use blasting as part of the mining process. Blasting is regulated by the Wisconsin Department of Safety and Professional Services. The requirements are spelled out in SPS 307. The Wisconsin Industrial Sand Association (2013) identifies two ways groundwater can be affected by blasting. The first is the release of nitrogen in the form of nitrate (2013). This is because the most common blasting agent is ANFO, which is 94% ammonium nitrate and 6% fuel oil (2013). Although unlikely because polymers used in washing could remove residual materials, WISA notes it can occur with incomplete combustion, poor storage and handling, or residual substances adhering to rock and sand (2013). WISA notes that "In rare cases, blasting vibrations may loosen silt, sand and rock particles from the sides on an uncased well bore causing an increase in the turbidity of water derived from a well." (2013). While increased turbidity is not a health concern, it can cause significant problems for the well owner with damage to pumps and piping.

There has been an increase in complaints about the impact of blasting on wells in recent months. Malone noted in the focus groups conducted for the committee, that one participant noted a change of taste in her water following blasting. Malone shared that another participant talked about a neighbor who had his well replaced by the mining company because of the damage caused by blasting (personal communication, August, 2014). Dr. Sarah Slaby, a committee member, has spoken with individuals who have shared their complaints about the impact of blasting on their wells. Dr. Slaby also spoke with the Gold'n Plump management team about their feed mill north of Arcadia. The team feels that their operation is being impacted by blasting damage to their well.

The results of a survey conducted by Malone in 2014 also indicate that NMISM may be impacting well water quality. Nearly 72% of respondents have observed no change in the water provided by their well since 2010. The most frequently observed change in well water quality has been an increase in sedimentation at 8.7% (personal communication, 2014). Changes in color (5.6%) and taste (5%) have also been observed (personal Malone, 2014).

Feed mill leadership confirmed that since the summer of 2013 to current date, they have had an increase in the number of times they have had to clean the very fine sand from their water system. They have had to lift the pump numerous times in a short period of time. Their records have kept track of equipment failure dates, repairs, well expert visits, and new equipment they have needed to add. They spent several thousand dollars on sand separators and specialized screens to minimize the sand in the water. It appears the sand in their well water has increased by approximately 500% compared to past years. Their 180 foot well was installed in 1997, and they use about 5000 gallons of water per day to produce steam to pelletize poultry feed. There have been dates this summer (2014) when they have not been able to use the water to make steam because the very fine sand causes equipment failure. They are currently looking into drilling a new well because of their increased costs and equipment failure. The well expert that has evaluated the mill's water problems wonders whether the increased sand could be a function of the blasting that is occurring at nearby NMISMs.

Transcript of interview conducted by Dr. Sarah Slaby with Gold'n Plump Management, 2014.

Surface Water Background

In Trempealeau County, like most of west central Wisconsin, surface water is synonymous with rivers and streams. Major river systems include the Buffalo River in the north, the Black River in the southeast, and the Trempealeau River through the central and southwestern part of the county. According to the Department of

Land Management (DLM), excluding the Mississippi, Trempealeau County has a total internal surface water area of 1600 acres (2011). The majority (74%) of this surface area is streams and rivers while small lakes and artificial mill ponds account for the remaining 26% (2011). The DLM states that the county has 59 miles of streams identified as Exceptional Resource Waters according to NR 102(2011). On the other hand, the DLM notes the county has 26.5 miles of streams that are on Wisconsin's 303d impaired waters' list (2011). These waters provide habitat for wildlife and activities for residents.

Key Finding 1

Much of a NMISM's potential impact on Trempealeau County surface waters is regulated by the DNR.

All NMISMs must receive a Wisconsin Pollutant Discharge Elimination (WPDES) Storm water Permit as described in NR 216. The WPDES general permit regulates and authorizes storm water discharges and process wastewater contaminants. The permit does not cover all discharges. It does require adequate systems to control storm water and wastewater. It also requires regular reporting. The WPDES requirements are enforced by the DNR if the permit holder self-reports a violation or if a complaint is brought to the DNR.

Any NMISM that intends to drill a well or wells with a total capacity greater than 70 gallons per minute is required to get a high capacity well permit under NR 216. The DNR issues the permit and reviews each application to determine whether the new well along with other wells on the property would cause significant environmental damage to wetlands, streams, rivers, lakes, private wells, and public wells. Well owners are required to report to the DNR how much groundwater has been pumped on an annual basis. DNR water regulations and zoning requirements may need to be complied with if a mine or processing site is located next to wetlands or surface waters.

Local units of government generally control mining operations through zoning. **Where zoning is in effect, local government can impose regulations on a variety of issues including depth of mine (proximity to the water table) (emphasis added).** Counties directly administer NR 135, the nonmetallic mining reclamation rule.

Key Finding 2

NMISMs have negatively impacted surface quality water in the county.

NMISMs in Trempealeau County have violated storm water regulations. The releases have negatively impacted the surface waters of the county. In May, 2013, four Trempealeau County NMISMs violated their WPDES permits when they allowed storm water to carry sand into nearby streams and wetlands. Sand gets in the way of microorganisms and can kill fish and aquatic plants and cause algae blooms. The Wisconsin Department of Justice ended up fining one company $200,000 because it failed to prevent pollutants from getting into surface waters and because it did not inform the DNR that it was expanding. A second mine was just fined from stormwater releases also occurring in May, 2013. Photographs 1 and 2 show the impact of a stormwater release on streams. These photographs were taken by Jake Budish, DLM, on an inspection after last spring's rainstorms. They illustrate stormwater discharge into a navigable stream. This was one of the stormwater violations that resulted in DNR enforcement action. Note that the darker area of the water in the photograph is the clean water, not a shadow. The stormwater is the beige color. You can also see sludge in Photograph 2.

Photograph 1. Stormwater discharge to a navigable stream, 2013. Photo by Jake Budish, DLM.

Citizens are also observing changes in surface water quality. In the survey conducted by Malone participants were asked if they had a body of water (pond, river, stream, or wetland) on their property (2014). Twenty-five percent of all respondents indicated that they had a water body on their property (Malone, 2014). While just fewer than 52% of the respondents with a water body indicated that they had observed "no change" in the water body almost 11% of the respondents indicated that they had observed increased sedimentation (Malone, 2014). A change in color was observed by 9.9%; almost 11% had observed a change in quantity; 6.6% observed changes in animals living in the water body; and 5.5% observed changes in plant species living in the water body (Malone, 2014).

Photograph 2. . Stormwater discharge to a navigable stream, 2013. Photo by Jake Budish, DLM.

While NMISMs can impact surface water quality, there is evidence that enforcing the regulations help protect the water resources. Budish noted that he regularly inspects the mines and takes photographs to document the impact of the mines (personal communication, August 29, 2014). Photograph 3 was taken this June from roughly the same position as Photograph 2. The improved clarity and decrease in turbidity is readily evident. To achieve this improvement, erosion control practices were significantly improved. Without adequate groundcover, stormwater moves faster over the surface and causes more damage. In Photograph 4, the site has been successfully seeded down and erosion control logs

Photograph 3. One year after enforcement action by the DNR, 2014. Photo by Jake Budish, DLM.

have been put in place to slow down water flow. As Budish notes, “I haven’t had any enforcement complaints on these sites this year” (Budish, 2014).

Photograph 4. Alpine Mine one year after enforcement action with erosion control practices installed. Photo by Jake Budish, DLM.

Summary

Trempealeau County has access to significant amounts of potable water that is generally of high quality. However, groundwater in the county is susceptible to groundwater contamination from a variety of sources. Because of the expense and technical difficulties associated with cleaning up groundwater, sound policy emphasizes resource protection. The implementation of appropriate preventive policies will minimize future contamination of our groundwater resource and ensure access to potable water for consumption, industry, agriculture, and wildlife.

The sand and gravel aquifer and the sandstone/dolomite aquifer provide groundwater users in the county with access to a significant water supply. Demand is increasing from all sources and NMISM adds to the increased demand for groundwater. Policies need to consider strategies that allow access to the recess but encourage conservation in order to ensure that groundwater recharge is adequate for maintaining the water supply in Trempealeau County. In order to achieve the goal of a potable, sustainable supply of groundwater and to minimize the impact of potentially harmful chemicals, the Water Quality sub-committee of the Health Impact Study – Moratorium Committee makes the following recommendations:

Groundwater Recommendations

GW1. Permit holders will develop and provide to DLM a groundwater monitoring and mitigation plan. The plan (adapted from the MEQB, 2014) shall include the following components:

f. A review of all available hydrogeologic data. It shall include an assessment of groundwater vulnerability throughout the lifespan of mining operations and reclamation.
g. Identification of all chemicals that will be used at the site. This information shall include all known residual contaminants and known breakdown products. Permit applicants will also describe how the chemicals will be managed and identify potential pathways for the chemicals to enter Trempealeau County water resources.
h. Identification of all groundwater users within a one mile radius of the site.
i. Identification of potential contaminant sources within a one mile radius of the site. A review of any known groundwater contamination within a one mile radius of the site should be included.
j. Identification of nearby surface waters that may encroach on the site during flooding.

GW2. Permit holders shall be responsible for installing, maintaining, and analyzing the data from a groundwater monitoring well network. Such network should be configured to provide adequate water quality information up gradient and down gradient of the project site.

GW3. Permit holders shall be responsible for collecting groundwater samples from monitoring wells and drinking water wells within 1 mile radius of the site prior to mining operations. This will establish “background” groundwater quality.

GW4. Once mining begins, monitoring wells shall be tested quarterly for the following parameters:

i. pH
j. Hardness
k. Specific conductivity
l. Temperature
m. Total coliform bacteria
n. Nitrite + nitrate-nitrogen
o. Iron, manganese, and arsenic.
p. Volatile organic compounds (VOC’s) to detect leakage from vehicles and equipment used at the site

GW5. Drinking water wells within 1 mile of the site shall be tested annually by the permit holder for the parameters listed in GW4.

GW6. Anionic food grade polyacrylamide-based flocculants should be used in order to minimize the potential for acrylamide contamination. At sites using polyacrylamide-based flocculants:

a. Acrylamide
b. Total Kjeldahl nitrogen (EPA method 351.2)
c. Nitrate+nitrite (EPA method 353.2)

GW7. We recommend that poly-diallyldimethylammonium chloride (p-DADMAC) based flocculants not be used in any NMISM operations because testing methods are currently unavailable.

GW8. All sampling and monitoring results shall be submitted to the DLM annually. Any results that show potential contamination will be subject to additional monitoring and mitigation as requested by the DLM following their review of the annual results.

GW9. Monitoring shall continue for a minimum period of at least 5 years following final site reclamation. Further monitoring may be required based upon a review of the monitoring data compiled.

GW10. All blasting shall follow best management practices. Any damage to livestock, buildings, infrastructure, and wells within one mile of the site shall be the responsibility of the permit holder to repair or replace. Damage beyond the one mile radius of the site shall be evaluated by an independent consultant, at the expense of the permit holder, to determine the impact blasting had on the damage.

GW11. Water from any high capacity well permitted in Trempealeau County cannot be transferred or sold industrial or agricultural use out of the county.

GW12. The county will at least maintain the current distance of 10 feet of NMISM from the water table.

Surface Water Recommendations

SW1. The distance of NMISM from an exceptional water resource or a trout stream shall be increased.

SW2. The distance of NMISM from any other wetland or waterway shall be increased.

SW3. All process and settling ponds shall be lined.

SW4. Create closed-loop systems to maximize the recycling of water and to eliminate potential discharges to Trempealeau County groundwater or surface waters.

SW5. Applicants shall test sediments accumulating in process and storm water ponds prior to reclamation for the parameters listed in GW4. If flocculants are in use on the site, the applicant shall additionally test for the parameters listed in GW6. These sediments/slurries shall not be discharged to the mine or used in reclamation until they meet federal and state health-based drinking water criteria for the contaminants in GW4.

SW6. Enclose all significant materials and processes to the extent possible to minimize contact with storm water.

SW7. Storm water retention ponds need to be bigger by a minimum of 75% and use best practice management when constructing the retention ponds.

SW8. The sand/mud/flocculants sludge must be stored in a designated location with well-constructed berms or retention ponds to prevent run off of the material after a heavy rain.

SW9. Any natural waterways should be monitored (during mining and several years after mining) for water quality within a half mile of a mining site by county officials.

References

Barr Engineering Company. (October, 2013). *Environmental impacts of water treatment chemicals at industrial sand mines.* Retrieved from https://www.barr.com/download/331

Department of Natural Resources. (2012a). *Silica sand mining in Wisconsin.* Retrieved from http://dnr.wi.gov/topic/Mines/documents/SilicaSandMiningFinal.pdf

Department of Natural Resources. (2012b). *Wisconsin water use: 2012 expanded withdrawal summary.* Retrieved from http://dnr.wi.gov/topic/WaterUse/WithdrawalSummary.html

Gebert, W., Walker, J., & Hunt, R. (2011*). Groundwater recharge in Wisconsin – annual estimates for 1070-99 using streamflow data.* United States Geological Survey.

Lentz, R., Andrawes, F., Barvenik, F., and Koehn, A. (2008). Acrylamide monomer leaching from polyacrylamide-treated irrigation furrows. *Journal of Environmental Quality*, 37, 2293-2298.

Malone, P. (2014). *Report on the final results of the citizen survey on the impacts of industrial sand mining in Trempealeau County* [draft].

Russell, J.M. (2013, December). *Frac sand fever, flocculants, and public health fears.* Retrieved from http://www.law360.com/articles/493591/frac-sand-fever-flocculents-and-public-health-fears

SNF Floerger. (n.d.). *Anionic polyacrylamide-environmental data sheets 1-9.* Floerger AN 900 Series.

Trempealeau County Department of Land Management. (2011). *Trempealeau County land and water resource management plan.* Retrieved from http://tremplocounty.com/landmanagement/LandCons/LwrmPlan.PDF

United States Department of Agriculture. (2008). *Polyacrylamide (PAM) and biopolymer update.* Retrieved from www.ars.usda.gov/SP2UserFiles/Place/36253000/MHM2/MHMD3.ppt

United States Geological Survey. (2008). *Protecting Wisconsin's groundwater through comprehensive planning (*Trempealeau County). Retrieved from http://wi.water.usgs.gov/gwcomp/find/index.html

Wisconsin Geological and Natural History Survey. (1989). *Groundwater contamination susceptibility in Wisconsin.*

Wisconsin Industrial Sand Association. (2013). *Groundwater and industrial sand mining.* Retrieved from http://www.wisconsinsand.org/resources/

Light Committee

Sub-committee members: Ellen Ott Gundersen, Chair and Cristeen Custer

Background

The goal for this research on light pollution in Trempealeau County is to ensure that light pollution from industrial sand mining sites isn't adversely affecting the health of the citizens and degrading the rural community environment. The desired outcome is to keep habitation and recreation spaces in the vicinity of NMISM sites free from unwanted light trespass, glare, and over illumination.

Many Trempealeau County residents enjoy dark starry nights and take for granted that this will always be the case. Unless a comprehensive approach that limits artificial nighttime lighting is developed, dark skies in the county may disappear. County residents will no longer be able to view the stars at night, and those living in rural settings near sand mining operations could be subject to continuous light at night. Light pollution can impact the health of county residents and the desirability of living in Trempealeau County.

NMISM and related activities have the potential for producing light emissions and contributing to ambient light pollution. In *Tools to Assist Local Governments in Planning for and Regulating Silica Sand Projects* it is noted ambient light is a regional environmental problem with many contributing sources, including residential, commercial, and recreational land uses (Minnesota Environmental Quality Board [MEQB], 2014). The number of NMISMs operating 24 hours a day in Trempealeau County would degrade the local night sky and impact the circadian rhythm of county residents, visitors, livestock, and wildlife (MEQB, 2014).

The most effective way to set lighting requirements that apply to all light sources is through

ordinance. The International Dark-Sky Association and the Illumination Engineering Society have developed model ordinances that local governments can adapt to meet local needs (MEQB, 2014). The MEQB suggests that lighting requirements can be also addressed through conditional use permits (CUPs) by requiring photometric plans that include performance standards (2014).

The challenge with regulating NMISM night-time light emissions is balancing worker safety at night and the impact the emissions have on humans and the environment. Scientists are developing a better understanding of the impact artificial night lighting. For example, Evans-Ogden's work on the deaths of migratory birds around tall lighted structures is well-known (Evans-Ogden, 1996). Examples of less well-recognized research include the influence of light pollution on behavior by Buchanan (1993) and ecology of species (Longcore and Rich, 2004. Medical research by Stevens, et al links cancer to the disruption of circadian rhythms and sleep deprivation (2007).

Key Finding 1

Levels of light pollution are increasing in Trempealeau County.

Trempealeau County residents, visitors, and communities value dark starry nights like they value the rolling hills, clean water, clean air, and abundant wildlife. Ambient light pollution by from human sources is rapidly changing the night-time environment. An examination of Figure 10 shows that significant portions of Trempealeau County are still free from light pollution. This figure was developed by the MEQB from the night sky atlas developed by Cinzano, Falchi, and Elvidge (2001).

Night time light has increased in the mid-section of the county around the cities of Arcadia, Blair, Independence, and Whitehall. These communities are among the county's largest population centers and have both industry and mining. The very northern and southern portions of the county also have significant night light pollution because of their proximity to the standard metropolitan

statistical areas of Eau Claire and La Crosse.

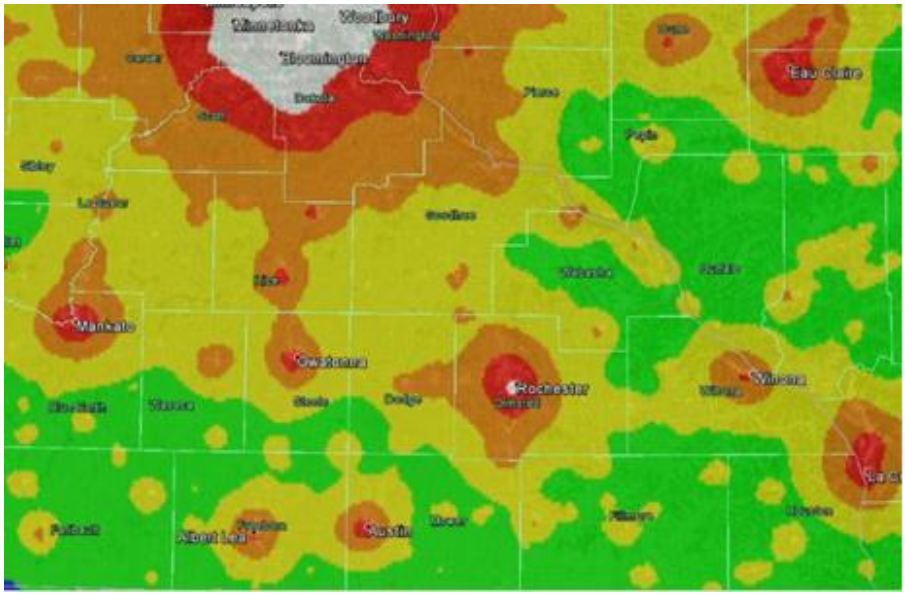


Figure 10.Overlay of model brightness on Google Maps, downloaded 11/14/2013.

Key Finding 2

State and federal guidelines provide requirements for worker safety, but local governments can set outdoor lighting emissions.

Under CFR 29, Part 1910, the Occupational Safety and Health Administration (OSHA) sets standards and guidelines for lighting requirements within the workplace. These rules also apply to processing plants and loading stations independent from a mine site.

Federal regulations (30 CFR § 56.17001) specify standards for the illumination of surface working areas. The standard is “Illumination sufficient to provide safe working conditions shall be provided in and on all surface structures, paths, walkways, stairways, switch panels, loading and dumping sites, and work areas.”

Local governments, particularly those with municipal electric utilities, are encouraged to work with businesses to implement energy efficient, emission reducing lighting designs. An issue like night sky brightness requires a comprehensive approach to improve and maintain the overall quality of the

night sky. If Trempealeau County wants to limit and reduce light pollution, it would need to develop ordinances that would apply to all lighting sources.

Key Findings 3

Artificial light impacts the health of humans and wildlife.

Humans and wildlife did not evolve with artificial light. Scientific research suggests that exposure to light pollution can have lasting adverse effects on human and wildlife health. Emerging research suggests that many of our physiologic mechanisms depend on periods of darkness, much the same as insect development, turtle nesting behavior and prairie plant bloom are cued by periods of dark and cold (Chepesiuk, 2009).

A literature review yielded several studies that explored the effects of light pollution on human health and animal welfare. Two studies reviewed and cited showed increased risk of cancers, specifically breast cancers and colorectal cancers. One study examined light pollution in a large urban center (Stevens, 2008). In a 2011 study, Kloog, Pornov, and Rennert examined the effect of light in subjects' sleeping environments (2011). The studies documented an increase in cancer risk. Researchers suspect that the increased risk is a result of melatonin production being suppressed by the light at night (Stevens, et al, 2007). Melatonin is the hormone that is released at key times through the day to induce sleep in mammals. When it is suppressed there is increased tumor growth (Stevens, et al, 2007). Another proposed explanation is that light adversely affects thermoregulatory and immune functions thereby decreasing the body's ability to fight emerging cancers. Exposure to light at night is associated with increased breast cancer rates, but not increased lung cancer rates, suggesting a hormonal mechanism and supporting the proposed mechanism as stated above.

The exact levels at which light pollution causes harm has not been established; therefore no

acceptable level of safety for night time light exposure has been recommended.

Kemper documents the deleterious effects that light pollution can have on migrating neotropical birds (1996). Fatalities from direct collision or dehydration and exhaustion occur when birds become disoriented by light emanating from the landscape, which interrupts normal navigation mechanisms by starlight. This study was chosen to be included in this report because Trempealeau County is on the main migration routes from Central and South America to breeding areas in Canada. This study took place in Central Wisconsin over a 20 year period. Kemper concluded that light emanating from the landscape at night is disorienting and potentially fatal for migrating neotropical birds under certain weather conditions (1996).

Key Finding 4

Trempealeau County light pollution standards are unique to each site.

Lighting conditions in Trempealeau County are currently being applied to NMISMs on a site-by-site basis through the CUP. Light pollution plans are not standardized, and existing permit conditions are loosely worded. The existing ordinance that governs non-metallic mining does not include language specific to light pollution.

In Trempealeau County, light pollution is addressed as a specific condition at the permit stage for non-metallic mines. According to Budish, the county Zoning & Environmental Specialist, "Since each site is unique, the conditions are tailored for each site to allow the operator(s) to be flexible and help mitigate or avoid issues pertaining to light pollution."(personal communication, June 15, 2014).

A review of Environment and Land Use Committee (ELU) minutes provides a few sample conditions that pertain to lighting at an industrial mine site:

- Highway 53 Mine Site- Sand Products of WI LLC (owner/operator) - CUP Conditions (n.d.):

"All lighting will be shrouded from neighboring property owners to prevent light pollution."

- Cameron Rail, LLC-Guza South Site, CUP Conditions from ELU meeting on July 10, 2013: *"All lighting shall be shielded and directed towards operation of the Cameron Rail, LLC-Guza Site non-metallic sand mine."*

Key Finding 5

Light from NMISM and its related operations have impacted county residents.

NISM and processing and load out facilities are relatively new to the county so a limited number of citizens have been impacted by light pollution. Government officials for the county and cities of Arcadia, Blair, Independence, and Whitehall were asked to identify any complaints they have received related to unwanted nighttime lighting. These complaints are summarized below:

Trempealeau County findings:

No complaints reported about lighting from industrial sand operations located in the county. It was further noted that the very large annexed sites, such as Preferred & Hi-Crush, work around the clock and utilize lighting for their areas. Residents between Whitehall and Independence have also called in to the office complaining about the 24-7 light pollution from the High-Crush site. They were referred to each city as well since the mines are inside city limits.

"Regarding the Preferred mine site, the rail site is lit up like a landing strip now and some neighbors have complained to county officials in public settings. They were referred to the City of Blair."

City of Arcadia findings:

The following complaints referenced light pollution.

"When a representative (John Cross) talked to us, we discussed shining the light down on the process plant rather than up the valley. When will this occur?" (n.d.)

"What exactly will happen to make this less invasive in our bedroom?" (n.d.)

City of Blair findings:

The City Clerk provided two documented complaints about the effects of blasting on housing structures. There were no complaints specific to lighting on record.

City of Independence findings:

City Clerk reports no complaints have been filed.

City of Whitehall findings:

The following complaints were filed with the City of Whitehall regarding the impact of light from NMISM.

"Woke up with a migraine, Kids up most of the night." (12/17/2013)

"Lights from vehicles are reflecting in our bedrooms." (12/23/2013)

"Lights from vehicles are still reflecting in our bedrooms and living room." (12/27/2013)

"Lights from vehicles are reflecting in our bedrooms and living room, kitchen (main floor)." (12/28/2013)

Survey result findings:

Results from the survey conducted by Malone also demonstrate the impact light pollution is having on residents in the county (2014a). The survey question relating to light pollution read:

"In the past three years, the amount of man-made light visible at night from my home has… (Malone 2014a)." Participants were offered the choice of responding with "Increased;" "Stayed about the same;" "Decreased;" or "NA (not applicaple)" (Malone, 2014a). According to the survey results the amount of man-made light visible in people's homes has increased 19.4% over the past three years (Malone, 2014a).

Summary

Dark skies are an important part of rural life in Trempealeau County. In this county, most citizens have an expectation of dark skies at night. Light pollution disrupts circadian rhythms and can result in sleep deprivation for humans. Additionally, light pollution has negative impacts on wildlife by disrupting navigation and reproduction cycles. The lack of urbanized stressors such as light pollution, and access to an environment with significant wildlife resources are primary reasons that citizens have chosen to live in Trempealeau County. Unless a comprehensive approach is taken to limit artificial nighttime light, this valuable asset of dark skies will be lost. Now is the time to safeguard and preserve the dark nights currently enjoyed by the citizens of Trempealeau County.

The light sub-committee makes the following recommendations to protect residents and visitors from the negative effects of light pollution:

Recommendations

L1. Establish lighting ordinances that can be used to determine performance standards for all sources of night-time light.

L2. Create lighting zones that range from LZ0 to LZ4 (where LZ stands for "light zone"). These zones should follow the specifications spelled out in MEQB's *Tools for Local Governments* (2014).
In summary, the specifications include the following:

- LZ0 with .5 lumens per square foot will be the default zone for wilderness areas, parks, preserves and undeveloped rural areas.

- Up to LZ4 may be the default zone for areas with very high ambient lighting level needs such as heavy industrial users.

L3. Each lighting zone would have standards for the amount of allowable base lumens per site following guidelines set in MEQB's 2014 report (2014)

L4. New developments would have to comply with the lighting performance standards prescribed in the local lighting ordinance.

L5. Photometric plans would be a requirement of CUP's. Plans would include the following components:
- A pre-construction analysis to establish baseline night sky conditions.
- An assessment of future light impacts from NMISM and related activities.
- Changes (with the exception of emergency lighting) must be approved prior to implementation.
- A photometric diagram showing lighting levels of proposed fixtures.The plan should include the location and limits of outdoor lights and a photometric diagram showing predicted maintained lighting levels of proposed lighting fixtures.

L6. The lighting ordinance would include the following criteria:

- Require outdoor lighting with color temperature specifications no greater than 3000K.
- Require full-cutoff outdoor lighting fixtures.
- Specify zero percent uplight emissions above 90 degrees for area lighting.
- Require outdoor lighting fixtures that must be aimed, located, and maintained to prevent glare.
- Specify zero percent "property-line" backlight emissions to prevent light trespass onto adjacent properties.
- Stipulate adaptive lighting controls to dim or extinguish lighting when not needed in order to reduce wasted light.
- Encourage use of high-pressure sodium lamps and narrow-spectrum Light Emitting Diode (LED) lighting systems when color rendering light is not needed.

L7. Consider hiring or contracting with an engineer or lighting professional to work for the county to review and approve projects at the cost of the applicant.

Additional resources

To download the Joint IDA-IES Model Lighting Ordinance (MLO), go to the Illuminating Engineering Society website: http://www.ies.org/PDF/MLO/MLO_FINAL_June2011.pdf

For more information on the impacts of light pollution, sample ordinances, and approved "Dark- Sky" lighting, go to the International Dark-Sky Association website: http://www.darksky.org/

Effects of Artificial Lights on Wildlife:
Http://www.wildlandscpr.org/biblio-notes/effects-artificial-lighting-wildlife. N.p., n.d., Web 4 Nov. 2013

References

Chepesiuk, R. (2009). Missing the dark: health effects of light pollution. *Environmental Health Perspectives*, *117(1).*

Cinzano, P., Falchi, F., & Elvidge C. (2001). The first world atlas of the artificial night sky brightness. *Monthly Notices of the Royal Astronomical Society*, *328*, 689-707.

Evans-Ogden, L. (1996). Collision course: the hazards of lighted structures and windows to migrating birds. *World Wildlife Fund Canada and the Fatal Light Awareness Program*.

Kloog, I., Pornov, B., & Rennert, H. (2011). Does modern urbanized sleeping habitat pose a breast cancer risk? Retrieved from www.internation-light-pollution.org/pdf/CBI-Urban-Light.pdf.

Longcore, T., & Rich, C. (2004). Ecological light pollution. *Frontiers in Ecology and the Environment, 2(4),* 1991-1998.

Malone, P. (2014). *Report on the final results of the citizen survey on the impacts of industrial sand mining in Trempealeau County* [draft].

Minnesota Environmental Quality Board. (March 2014). *Tools to assist local governments in planning for and regulating silica sand projects.* Retrieved from https://www.eqb.state.mn.us/sites/default/files/documents/Tools%20for%20Local%20Govt%20approved%20March%2019.pdf

Stevens, R.G., Blask, D.E., Brainard, G.C., Hansen, J., Lockley, S.W., Provencio, I., Rea, M.S., & Reinlib, L. (2007). Meeting report: the role of environmental lighting and circadian disruption in cancer and other diseases. *Environmental Health Perspectives*. 115(9).1357-62.

Sound

Subcommittee Members: Paul Winey (chair), Elizabeth Feil, and Pamela Nelson

Background

Noise impacts the health of humans. This has been recognized nationally since the passage of the 1972 Noise Control Act. Research supports noise control indicating noise at excessive levels can impact physical and psychological health. The noise levels established in our current ordinance are not sufficient to protect health based on what research is telling us.

Trempealeau County has long been home to gravel pits and sand pits, which have provided raw materials for local road building and other construction operations. In the last five years, however, a type of mining new to Trempealeau County, non-metallic industrial sand mining (NMISM), has developed. These NMISMs are many times larger than the familiar gravel pits that have long been part of the county's landscape. They use more and larger equipment, disturb many more acres of land, and often include or require access to processing facilities and transportation facilities that were never part of traditional gravel pit operations. In short, these new mines are large industrial operations that bring with them many of the same potential environmental and health impacts as other large, outdoor industrial facilities.

Federal, state, and local governments have historically regulated industrial operations to protect the health and safety of their residents. Governments have acted to protect residents from several types of pollution associated with industrial sources, such as industrial air and water pollution.

Since the 1970s, the United States government, along with state and local governments, has also acted to protect the public from excessive noise.

The U.S. Congress passed the Noise Control Act in 1972 to protect Americans from noise pollution in the same way that the Clean Air Act and the Clean Water Act protect Americans from air and water pollution. The purpose of the Noise Control Act was to set noise emission standards for products distributed in commerce, to promote research on noise control, and to provide information to the public regarding noise emission and reduction.

The Act states:

> "The Congress finds—
>
> (1) That inadequately controlled noise presents a growing danger to the health and welfare of the Nation's population, particularly in urban areas;

It further states:

> The Congress declares that it is the policy of the United States to promote an environment for all Americans free from noise that jeopardizes their health or welfare (49 USC)."

While Congress passed the Noise Control Act to protect the public from noise, it specifically stated in the Act itself that "the primary responsibility for control of noise rests with State and local governments." (49 USC).

Key Finding 1

Noise levels impact the health and well-being of people.

In order to understand why Congress felt it was necessary to protect Americans from noise, it is important to understand what noise is and how it is measured. Noise is defined as unwanted sound. Sound is the result of pressure changes in a medium, such as air. Suter (1991), in *Noise and Its Effects,*

notes that it is the amplitude of the pressure changes determines the sound level, which is measured in decibels (dB).

Sound level in decibels is a logarithmic rather than a linear measure of the change in pressure. The ear perceives a 10 dB increase as a doubling in the loudness of the sound. For instance, the human ear hears a 30 dB sound as twice as loud as a 20 dB sound. A 40 dB sound is heard as four times as loud as a 20 dB sound.

Sound can be measured at its source or at the place where someone might hear it. It can be measured as the moment it is perceived or it can be measured as a part of a composite, or average, over a period of time. Composite measures of noise include the equivalent continuous sound level and the day-night average sound level.

The Center for Hearing and Communication (2014) shares the decibel levels for a number of common sounds in their factsheet on noise. The softest sound a person with normal hearing can hear is 0 dB; a soft whisper is 30 dB; shouting in the ear is 110 dB; and thunder is 120 dB.
According to the Center, noise levels above 140 decibels can damage hearing in one exposure, and sound at 85 dB will harm hearing over time (2014). According to the National Institute for Occupational Safety and Health, the maximum safe exposure to a sound level of 85 decibels is eight hours (Niquette, 2014). Noises at high decibels aren't the only sounds that can negatively affect a hearer's health. The scientific and medical consensus is that sounds do not need to be that loud to cause physiological and behavioral problems.

In 1999, the World Health Organization (WHO) re-published *Guidelines for Community Noise*, a definitive report on the health effects of community noise (originally published in 1995) (1999). In it the authors defined "community" or "environmental" noise as "noise emitted from all sources except

noise at the industrial workplace. Main sources of community noise include road, rail and air traffic, industries, construction and public work, and the neighborhood" (WHO, 1999). WHO's comprehensive report listed a number of adverse health effects of noise including hearing impairment, diminished speech intelligibility, sleep disturbance, disrupted physiological functions, mental illness, diminished performance, and social and behavioral effects of noise including annoyance (1995, 1999).

The WHO provided guideline values in Table 1 of its report for community or environmental noise beyond which detrimental effects might be felt. Examples from the report include sleep being disturbed by noise at a level of 45 dB for adults and 30 dB for pre-school-age children (1995, 1999). The report also indicated that individuals in outdoor living areas may experience serious annoyance at noise levels of 55 dB day or night (1995, 1999). The table from *The Guidelines for Community Noise* is attached to the report as Appendix F.

The WHO also advocated noise management, beginning with the creation of a legal framework for noise management and the development of noise management plans. The report recommends that "the full costs associated with noise pollution (including monitoring, management, lowering levels and supervision) should be met by those responsible for the source of noise" (1995, 1999).
In 2009, the WHO published another comprehensive report on noise proposing nighttime noise guidelines for Europe (Kim and Berg, 2009). In this report, the WHO proposed a 40 dB averaged nighttime noise guideline measured in the bedroom with windows slightly open to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly (Kim & Berg, 2009).

Since Congress passed the Noise Control Act in 1972, noise control has become a component of many state and local regulations. For instance, Wisconsin PSC 128.14 regulates the noise that can be

emitted by wind turbines. PSC 128.14 sets strict wind turbine noise limits of 50 decibels during daytime hours and 45 decibels during nighttime hours. Daytime is defined as 6:00 a.m. until 10:00 pm., and the noise limits apply at the outside wall of a nonparticipating residence or occupied community building (PSC 128.14). The wind turbine regulation includes compliance and enforcement procedures to ensure that the noise limits are not exceeded.

Key Finding 2

Current noise limits do not protect county residents from the negative impacts of noise.

In Trempealeau County, the Non-Metallic Mining Ordinance places limits on noise from sand mining and processing. Under 3.02(1), a distinction is made between extraction hours and non-extraction hours. Extraction hours are Monday through Friday from 6:00 a.m. to 8:00 p.m. during Daylight Savings Time and between 6:00 a.m. and 6:00 p.m. during Standard Time; extraction time also includes Saturday between 7:00 a.m. and 3:00 p.m. (Ordinance, n.d.). The ordinance limits noise during non-extraction hours to 45 dB at the "outside of any building … used for human habitation or the housing of farm animals…" but does not limit noise during extraction hours (p. 91).

After reviewing existing scientific and medical literature on the health effects of environmental noise, this subcommittee has concluded that the County's existing non-metallic mining ordinance does not do enough to protect county residents and visitors from the detrimental health effects of environmental noise from NMISM. This is because the ordinance includes no daytime noise limit and because the nighttime noise limit is too high to protect the health and wellbeing of residents of quiet rural neighborhoods. Because the County's industrial sand mines are located in quiet rural settings, the County's ordinance should go farther in protecting people from noise and in preserving the resource of rural quiet.

In July, Trempealeau County held several focus group meetings to get input from county residents on the effects of sand mining in the county. Malone, in a personal communication with committee members, shared the comment of one resident, who lives near a mine (personal communication, July 28, 2014). Malone quoted the resident who said the following: "Who do they think they are fooling? I hear grinding of washing equipment, the beeping of trucks is very noticeable. I can't hear the silence anymore" (personal communication, July 28, 2014).

The special nature of rural settings has been recognized by researchers and environmental and health professionals. In its report, *Protective Noise Levels*, the Environmental Protection Agency (EPA) provided a chart showing the average sound levels in decibels of various outdoor environments (1974). These noise levels vary significantly. According to the chart, a person living in an apartment next to a freeway can expect to hear freeway noise at 97 dB while someone in a rural residential neighborhood will hear sound at 39 dB (EPA, 1974).

According to Shepherd, Welch, Dirks, and McBride in a 2013 article the research suggests that quiet rural areas provide greater health-related quality of life than noisy areas (2013). The authors recognize that people often choose to live in quiet areas in order to safeguard their health and wellbeing. After reviewing data from several studies, the authors concluded that quiet areas benefit public health by creating positive emotions, reducing mental exhaustion, and redirecting attention away from fatigue, which can improve a person's well-being (2013). Not only is health protected by the reduction of annoying industrial noises, the authors say, but it is further promoted by preserving in quiet areas the ability to hear softer, natural sounds like birds, wildlife, wind and rain (2013).

NMISMs in Trempealeau County are located in quiet rural neighborhoods. Often they are surrounded by areas that are zoned agricultural or residential. These are areas that are historically

peaceful and quiet, where residents can hear birds and wildlife, along with the occasional farm tractor. The peaceful, quiet nature of the county cannot be preserved, nor can the wellbeing of its residents, without the county taking additional steps to reduce the industrial noise from the mines and related processing and transportation facilities.

Summary

The scientific and political consensus is that environmental noise can have detrimental physiological and behavioral effects at any time of the day and especially at night. The WHO has proposed daytime guidelines to limit community noise to an average of 50 decibels to prevent moderate annoyance and has proposed nighttime guidelines to limit community noise to an average of 40 decibels to prevent sleep disturbance and adverse physiological effects (1999).

The guidelines proposed by the WHO are guidelines that are designed to limit noise in primarily urban environments. Trempealeau County is a rural environment. The WHO guidelines, developed primarily for urban environments, are insufficient to preserve the quiet of Trempealeau County's rural environment.

Since the start of the NMISM expansion in 2010, sand companies have advocated for the right to mine, process, and transport sand 24 hours per day. However, the right of the mining companies to create industrial sites throughout the county must be balanced against the responsibility of the county to protect the health and welfare of its residents and to protect the rights of its residents to enjoy the peace and quiet of their rural environment. This subcommittee's sound recommendations are designed to create such a balance.

Recommendations

N1. After reviewing the scientific and medical literature on the health effects of environmental noise, the subcommittee recommends that the County's existing Non-Metallic Mining Ordinance be revised as follows:

a. To create a daytime average noise limit of 50 decibels from processing, extracting and transportation activities during extraction hours.

b. To reduce the nighttime noise limit to 40 decibels. This 40 decibel limit is not an average, but rather a strict limit, recognizing not only the adverse health effects of nighttime noise above 40 decibels, but also recognizing the need to preserve the quiet rural nature of the county and the positive benefits of this quiet on the health and well-being of residents.

c. These limits should apply at all points on affected properties, so that affected property owners will have full use and enjoyment of all of their property.

N2. The subcommittee recommends maintaining in effect the balance of the noise regulations contained in the Non-Metallic Mining Ordinance, including the phase-one noise survey, the phase-two noise survey, and the procedures for waivers and complaints.

References

Center for Hearing and Communication. (2014). *Common environmental noise levels factsheet.* Retrieved from http://www.chchearing.org/noise-center-home/facts-noise/common-environmental-noise-levels

Environmental Protection Agency. (1972). *Noise Control Act of* 1972. Retrieved from http://www.epa.gov/air/noise/noise_control_act_of_1972.pdf

Environmental Protection Agency. (1974). *Protective noise levels.* Retrieved from http://nepis.epa.gov/Exe/ZyNET.exe/20012HG5.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1976+Thru+1980&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C76thru80%5CTxt%5C00000008%5C20012HG5.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p%7Cf&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL

Kim, R. & Berg, M. (2010). Summary of night noise guidelines for Europe. *Noise Health,* 12(47), 61-63.

Niquette, P.A. (2014). *Explanation of OSHA and NIOSH safe exposure limits and the importance of noise dosimetry.* Retrieved from https://www.etymotic.com/pdf/er_noise_exposure_whitepaper.pdf

Public Service Commission. (2012) *Wind Energy Systems*. Retrieved from https://docs.legis.wisconsin.gov/code/admin_code/psc/128.pdf

Shepherd, D., Welch, D., Dirks, K. and McBride, D. (2013). Do quiet areas afford greater health-related quality of life than noisy areas? *International Journal of Environmental Research and Public Health*, 10(4), 1284-1303.

Suter, A. (1991). *Noise and its effects.* Proceedings from the Administrative Conference of the United States. Retrieved from http://www.nonoise.org/library/suter/suter.htm

Trempealeau County Comprehensive Zoning Ordinance. (n.d.) *Chapter 13. Non-Metallic Mining.* Retrieved from http://tremplocounty.com/landmanagement/zoning/RevisedOrdinance/CHAPTER_13.pdf Trempealeau County Comprehensive Zoning Ordinance

World Health Organization, (1999). *Guidelines for Community Noise*. Retrieved from http://www.who.int/docstore/peh/noise/guidelines2.html

Air Quality

Sub Committee Members: Paul Winey (chair), Elizabeth Feil, Dave Larson, Ellen Ott, Lois Taylor, and Tim Zeglin

Background

Sand mining has been a long-standing industry in Wisconsin and is not new. What is new, however, are the burgeoning numbers of industrial sand mines in the western Wisconsin, eastern Minnesota and northeastern Iowa regions. Locally, Trempealeau County is home to twenty-six non-metallic industrial sand mines (NMISM) commonly called frac sand mines. Thirteen of these mines are located within the Town and City of Arcadia. Due to the close proximity of these numerous mines, application of existing air quality monitoring data may not be expected to have the same outcome. All data reviewed was taken from single mine operations. A linear, cumulative effect should not be assumed when considering that several mines are located not just within close proximity to each other, but in some situations adjacent to each other. Refer to the map in the Maps section. Because of this, the effects of air quality from industrial sand mining in Trempealeau County may not be the same as those of our neighboring counties. Therefore, specific recommendations regarding the potential impact and monitoring of non-metallic mines, as they pertain to air quality, will need to be individualized for our County. We can learn from other regions and agencies, but must apply our own judgment when determining the means necessary to ensure protection of the residents and visitors to Trempealeau County.

We could go days without food and hours without water, but we would last only a few minutes without air. Environmental Protection Agency's Fast Facts says that, on average, each of us breathes over 3,000 gallons of air each day (EPA, n.d). We must have air to live; but breathing polluted air can make us sick (EPA, Plain Guide). In 1970, Congress created the Environmental Protection Agency (EPA) and passed the Clean Air Act (CAA), giving the federal government authority to clean up pollution in this country. The CAA requires the EPA to establish National Ambient Air Quality Standards for six common "criteria pollutants" (EPA, Clean Air). These six pollutants are: particulate matter, ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide and lead (EPA, Six Common).

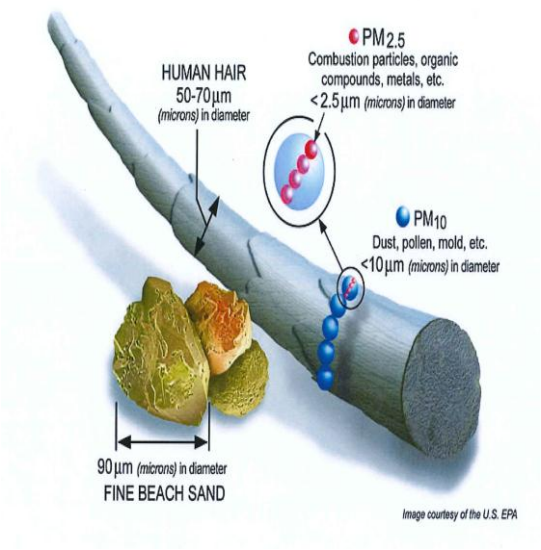


Figure 11. This figure shows the size of PM 2.5 compared to PM10 relative to the size of a human hair and beach sand.

States are required to adopt enforceable plans to achieve and maintain air quality meeting these air quality standards. According to the Clean Air Act Requirements and History state plans must also control emissions that drift across state lines and harm air quality in downwind states (EPA, Clean Air).

Other key provisions from the EPA are designed to minimize pollution increases from growing numbers of motor vehicles, and from new or expanded industrial plants. NMISM fits into both of these categories.

Of the six criteria pollutants, two are of principle concern when discussing NMISM. These are Particulate Matter (PM) and nitrogen dioxide (NO^2). PM, also known as particle pollution, is a complex mixture of extremely small particles and liquid droplets. PM is made up of a number of components,

including acids (such and nitrates and sulfates), organic chemicals, metals, and soil or dust particles (EPA, Particulate Matter).

In 1987 the EPA replaced earlier standards with a PM – 10 micrometer standard (PM-10). The EPA indicated that these particles are likely responsible for adverse health effects because of their ability to reach the lower regions of the respiratory tract (EPA, AIRTrends). These particles include those with a diameter larger than 2.5 micrometers or 10 micrometers or less (0.0004 inches or one-seventh the width of a human hair) (EPA, Particulate Matter). These particles are found near roadways and dusty industries.

Fine particles typically found in smoke and haze are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air.

Standards are set by the EPA for both PM-10 and PM-2.5. These are based upon primary and secondary standards as well as on 24 hour and annual exposure limits. Primary standards provide public health protection for populations such as asthmatics, children, and the elderly, which are considered at greater risk for negative health effects. Secondary standards provide public welfare protection, including protection against visibility and damage to animals, crops, vegetation, and buildings. Collectively these are referred to as the National Ambient Air Quality Standards (NAAQS).

National Ambient Air Quality Standards for Pollutants of Interest in NMISM.				
Pollutant	**Primary/Secondary?**	**Averaging Time**	**Level**	**Form**
Nitrogen Dioxide	Primary	1 hour	100ppb	98th percentile; 3 year average
Nitrogen Dioxide	Primary and Secondary	Annual	53 ppb	Annual Mean
Particle Pollution: PM2.5	Primary	Annual	12 $\mu g/m^3$	Annual Mean; 3 year average
Particle Pollution: PM2.5	Secondary	Annual	15 $\mu g/m^3$	Annual Mean; 3 year average
Particle Pollution: PM2.5	Primary and Secondary	24 hour	35 $\mu g/m^3$	98th percentile; 3 year average
Particle Pollution: PM10	Primary and Secondary	24 hour	150 $\mu g/m^3$	Not to be exceeded more than once per year over 3 year average

Figure 12. This figure is adapted from an EPA publication on the NAAQS. It shows the standards for the pollutants of most concern in NMISM (Air and Radiation, n.d.).

Key Finding 1

PM is correlated with significant health problems.

It is well recognized that particulate matter (PM-10 and less) is responsible for significant health problems. The EPA's "Fast Facts" on particulate matter identifies a number of potential health impacts The EPA notes that children are very susceptible to particulate matter because they breathe more rapidly than adults and they are more active (EPA, Fast Facts). The EPA states that many studies have linked particle pollution with many significant health problems including non-fatal heart attacks, premature death in people with heart or lung disease, aggravated asthma, and coughing or breathing difficulties (EPA, Fast Facts). The EPA also notes that particle pollution can occur all year and can remain suspended and travel hundreds of miles from their source (EPA, Fast Facts).

The World Health Organization (WHO) notes that research nationally and worldwide is linking particulate matter with grave health concerns (WHO, n.d.). There is good evidence of the effects of

short-term exposure to PM10 on respiratory health, but for mortality, and especially as a consequence of long-term exposure, PM2.5 is a stronger risk factor than PM10. According to the EPA, daily deaths from all causes are estimated to increase by 0.2–0.6% per 10 µg/m3 of PM10 (EPA, AIRTrends; EPA Particulate Matter). The EPA also notes that long-term exposure to PM2.5 increases the long-term risk of cardiopulmonary mortality by 6–13% per 10 µg/m^3 of PM2.5 (EPA, AIRTrends; EPA, Particulate Matter). These conclusions, together with numerous other studies show a definite correlation between PM pollution and health implications.

Key Finding 2

Controlling PM can improve health.

While PM can pose significant health risks, controlling this type of pollution will improve the health outcomes of people affected by it. The Harvard School of Public Health shared the results of a follow-up to their Six Cities Study. In 2006 three Wisconsin cities, Portage, Wyocena and Pardeeville; as well as Watertown Massachusetts; Kingston and Harriman, Tennessee; St. Louis, Missouri; and Steubenville, Ohio participated in the follow-up study (Harvard School of Public Health, 2006). The new study showed that when cities decreased PM, people lived longer. Three percent fewer people died for every reduction of one microgram/cubic meter (ug/m^3) in the average levels of PM 2.5 (Harvard School of Public Health, 2006). This is about the same as saving 75,000 people per year in the United States (Harvard School of Public Health, 2006). The greater the decrease in fine particulate air pollution, the greater the decrease in deaths (Harvard School of Public Health, 2006).

Key Finding 3

Trempealeau County may face increased air pollution potential because of the number of NMISM in close proximity to one another.

Particulate matter pollution from NMISM comes from fixed and non-fixed sources. Fixed sources include the following: transfer points of machinery (grizzly, crusher); conveyors/elevators; processing plants (drying facilities); and transfer/loading facilities (truck/rail). Non-fixed sources include fugitive dust created by wind/air movement; vehicle emissions; and truck/rail transport in and out of the mines.

The Wisconsin Department of Natural Resources (DNR) only requires application for an air quality permit when a drying processing plant is requested. Wisconsin law, NR 415.075 (4)(b,) allows DNR to grant a variance from air quality monitoring. Even when air monitoring is required, current DNR practice is to limit it to the PM-10 level, not the PM-2.5 level that includes those particulates considered more damaging to health. Compliance of fugitive dust control plans is left up to the individual mines and is monitored by a limited number of DNR officials. Each mine is required to develop and maintain a site specific fugitive dust control plan. This can include application of water or calcium chloride to minimize dust, washing of vehicles exiting the mine site, track pads that can be washed or swept clean, covering loaded trucks, etc. Prengaman noted in 2013 that these fugitive dust control plans and other compliance issues are not employed consistently at mine sites (Prengaman, 2013). More often than not, non-compliance issues come as a result of “citizen complaints” rather than initial DNR discovery.

Further, DNR considers most NMISM and processing to be a “minor” source of air pollution (EPA, Air permits). As such, the department does not consider the amount of air pollution created by

"fugitive dust" when considering the total pollution allowable by a source. It can include fugitive dust as a portion of total pollution. Currently, an air quality permit is being challenged in this regard. The permit, as applied for, accounts for all allowable particulate to be generated by the processing plant and does not take into account that generated by fugitive sources. If the amounts generated by fugitive dust were included in the total, the output would exceed EPA standards for air quality. The contested permit also does not model for NO_2 exposure from blasting. Further, modeling for this permit was based upon ambient air sampling taken before 2008, which may not accurately reflect current ambient air levels of PM (Petition, 2013; Klafka, 2013). Minor sources of pollution are considered to produce less than 100 tons per year of any criteria pollutant. Major sources produce 100 or more tons per year of criteria pollutants.

Diesel particulates have been declared a group 1 carcinogen (cancer causing agent) by the World Health Organization and the International Agency for the Research on Cancer (DHHS, 2011; WHO, 2012). The DNR currently does not require NMISM companies to monitor for these potential pollutants. Given the relative close proximity of several mines, and limited County and State highway transport routes, there exists a serious potential increase of diesel particulate exposure to those living, working, or visiting near mines or transportation routes.

NO_2 generated from blasting is not even monitored by the DNR. Further, the State has not adopted current EPA standards on allowable NO_2 levels even though required by law. Again, citing the close proximity of several mines that have requested blasting in the conditional use permits the cumulative effect of this "criteria pollutant" should be monitored.

Key Finding 4

Crystalline Silica is a PM of particular concern in NMISM.

One component of PM of particular concern is crystalline silica. Crystalline silica is known to cause acute and chronic silicosis. Research by Calvert, Rice, Bolano, Sheehy, and Sanderson indicates that crystalline silica is also known to cause chronic obstructive pulmonary disease; cancer; and autoimmune disorders such as lupus, rheumatoid arthritis, Wegener's granulomatosis, and IgA nephropathy (2003). Sand particles smaller than 10 micrometers, and especially those smaller than 4 micrometers, pose the greatest health threats. California, Texas and four other states have established silica standards. California's standard at PM-4 is 3µg/m^3 for silicosis risk; Texas' standard at the PM-4 level is 0.27 ug/m^3 for cancer risk (Collins, Salmon, Brown, Marty, & Alexeef, 2005; Meyers, Lee, & Grant, 2009). Wisconsin has not set standards regarding crystalline silica.

A study by Richards and Brozell, has failed to show an increase in ambient silica attributable to industrial sand mining (2014). At the same time, studies by Crispin, Fay, and Nelson (2012) have found that there were times when the level of silica at the periphery of the mines studied exceeded the reference standards for all six states that have established silica levels (2012). There is some degree of controversy associated with both of these studies. The recently released "Ambient PM4 Crystalline Silica Sampling" of EOG mines in Chippewa and Barron counties by Richards and Brozell has not yet been reviewed by independent sources for validity. While not showing an increase in ambient crystalline silica special attention should be made to selection of air monitor sampling sites and predominant wind direction. The study does fall short of the three year averaging specified by the EPA for air quality and does not preclude potential hourly spikes that would be masked by 24 hour averaging. There is also no mention of the size of the mines studied. The three mines and one

processing plant studied were also separated by significant distances. Concerns have also been expressed about the methodology used by Crispin, Fay, and Nelson in their studies as well.

The National Institute for Occupational Safety and Health (NIOSH) has identified exposure to airborne silica as a health hazard among workers at hydraulic fracturing sites (n.d.) This exposure is to the same product that is mined, processed and then shipped from area mines. NIOSH collected 116 samples from 11 hydraulic fracturing sites in five states (Arkansas, Colorado, North Dakota, Pennsylvania, and Texas) (OSHA, n.d.). Of the samples collected, 47% were at levels greater than the calculated OSHA Permissible Exposure Limit (PEL) and 79% showed silica exposures greater than the NIOSH Recommended Exposure Limit (REL) of 0.05 mg/m^3 (n.d.). While these samples were taken at hydraulic fracturing sites and not mining operations, it identifies the potential hazards connected with working with this product. The OSHA article made several suggestions to protect workers from exposure to silica including the use of alternative "proppants" such as ceramics rather than silica, air monitoring, and control of dust (n.d.).

Without adequate and appropriate air quality monitoring, identification of public exposures and health complications from non-metallic mining will be next to impossible. Epidemiological trends rely upon emergency room data or morbidity/mortality reports. The populations most at risk to develop complications from long term exposure to PM and especially silica are the very young and the elderly. In these situations, the elderly will die of an otherwise expected complication of old age. The very young will most likely grow up and relocate from the area. This precludes any ability to track and trend epidemiologic health complications. Complications from chronic silicosis may take 20 plus years to develop. These complications can occur with long-term

repeated low levels of exposure. Two additional cases of childhood asthma within a neighborhood will go virtually unnoticed as connected to environmental exposures. Later, when the children are grown and move, association of the progressive lung disease will be nearly impossible to link to their childhood exposure.

There is also concern being raised regarding the effectiveness of the current EPA standards in protecting individuals. These standards were designed to protect regions, not just specific persons. Also coming into question are the effects of repeated, long-term exposure at “normal limits”. Current 24 hour exposure limits as set by the EPA are averaged. As Brown, Weinberger, Lewis, and Bonaparte (2014) indicate this 24 hour “average” could include significant one hour levels that exceed safe limits, but that are masked by the remaining 23 hours of “safe” exposure. The persons living within close proximity to a mine could have multiple exposures exceeding current limits over decades and still have the mine “within compliance” of current air standards. Periodic monitoring at hourly intervals would move to eliminate or reduce the inherent errors of 24 hour averaging. Brown, Weinberger, Lewis, and Bonaparte also examined the effects of indoor PM in this same study (2014). Indoor PM was used as a surrogate to monitor for Volatile Organic Compounds (VOCs) and other toxic substances. Identification of higher levels of PM can show exposure to other toxins as well.

Trempealeau County has entered into a Memorandum of Understanding (MOU) to conduct an outdoor air monitoring program with the University of Iowa. Measures of PM 2.5 will be taken at sites within ½ mile of active mines. Final results of this study will not be available at time of publication of this report, but further review and possible continued monitoring should be discussed.

Simplified specifics of methods of air monitoring are a challenge even for professional engineers. Nuances of limits of testing equipment and methods are debated by the mining industry and the public sector. A detailed catalogue of testing options, including costs, has been developed by the Minnesota Environmental Quality Board, "Tools to Assist Local Governments in Planning for and Regulating Silica Sand Projects," approved March 19, 2014.

A number of questions that were included in the survey conducted by UW-Extension Trempealeau County for the committee were targeted towards some of the specific concerns identified by the air quality sub-committee. These included residents' perceptions on whether outdoor and indoor air quality had worsened over the past two years; identification of additional potential sources of PM within ½ mile of the residents in the study area; self-identification of households with individuals having chronic diseases caused by or aggravated by PM; and the age ranges of the populations within ½ miles of permitted mines. The results of this study will serve as a baseline for these factors as mining in the county progresses.

Just under 24% of all respondents indicated that outdoor air quality, as defined by Malone (2014) had worsened in the past two years. While the overwhelming majority, nearly 76%, indicated that outdoor air quality has stayed about the same, a small percentage (0.4%) indicated air quality had improved during the time period (Malone, 2014). When asked about indoor air quality, just under 18% of respondents indicated that their indoor air quality had gotten worse while over 81% of the respondents indicated that indoor air quality had stayed about the same (Malone, 2014). In a personal conversation with the author, Malone emphasized that the survey was sent to households within ½ mile of a permitted mine and not all permitted mines are currently active (personal communication,

June 23, 2014). Malone indicated this survey provides a baseline for the areas most probably impacted by mining today and into the future (personal communication 2014).

Industrial sand mining is not the only source of PM in Trempealeau County. Survey participants were also asked to identify additional potential PM sources within ½ mile of their homes. The top three activities included cash cropping (24.5%), other industrial activities (20.4%), and dairy operations (19.9%) (personal communication, 2014). The other industrial activities include furniture manufacturing, cheese manufacturing, and chicken processing among others.

Based on the information provided in EPA's Fast Facts (n.d.), the survey asked if any of the residents in the home had the following conditions: chronic lung disease, cardiovascular diseases, or diabetes. Malone's analysis of the survey responses indicate that there is a significant population that may be at increased risk of harm from PM because of pre-existing health conditions (personal communication, 2014). Malone's results show that just under 16% of respondents indicated someone in their household suffers from chronic lung disease; over 31% of households have at least one individual who suffers from cardiovascular disease; and 12% of households had individuals suffering from diabetes (personal communication, 2014).

Participants were also asked a series of behavioral questions to determine if their health was being impacted. These questions asked if visits to the emergency room, visits to a primary health care provider, days missed from work, or days missed from school had increased, decreased, or stayed the same. These results are summarized in Malone's report with the following graph.

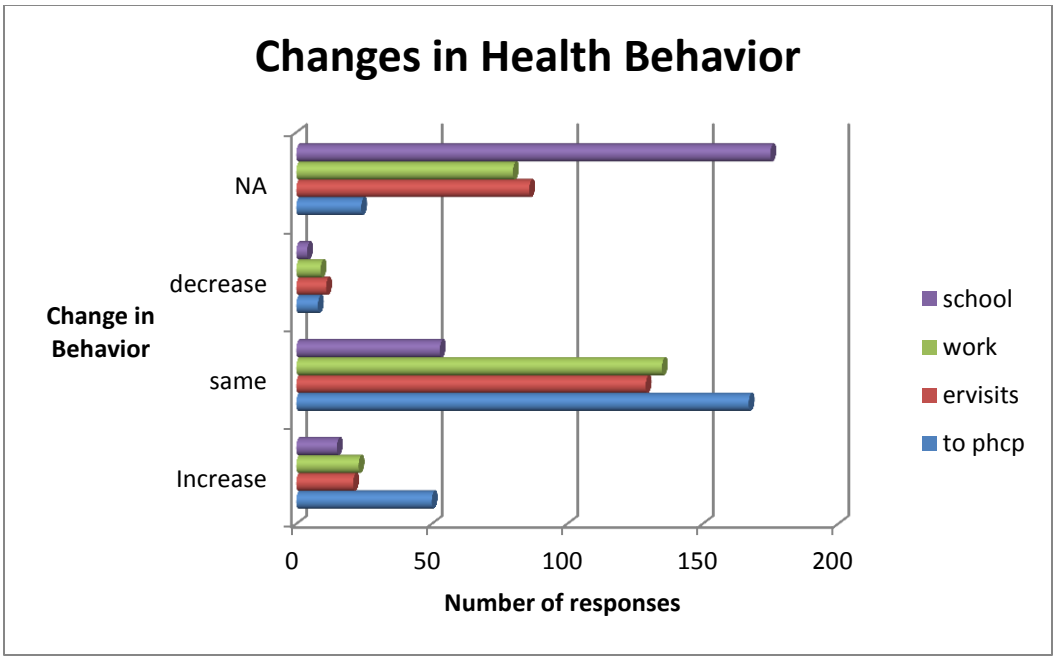


Figure 13. Changes in Health Behaviors self-reported by respondents in a 2014 random sample survey conducted by Malone (2014). This graph is used with Malone's permission.

Survey participants were also asked to list how many people in different age categories resided in their households. This wasn't just a basic demographic background question. It is also another measure of identifying the potential number of at risk individuals in the mining area. EPA's Fast Facts and other sources indicate that individuals most at risk from exposure to PM are the very young and the elderly (Fast Facts, n.d.). Malone's results indicate that just under 21% of the population represented by the sample are between 0 and 18 years of age and people aged 65 and older represent 17.6% of the sample population (2014).

Key Finding 5

The lack of reliable, accurate research about NMISM suggests extreme caution is the prudent response.

Reliable, accurate scientific data about the safety of industrial-scale silica mining is scarce. This lack of valid scientific data creates great uncertainty about the safety of such mining, and this uncertainty applies also to smaller-scale silica sand mining operations. The few existing long-term studies have all been conducted on individual, isolated sand mines, while the cumulative effects of several mines located in close geographical proximity to one another has never been studied. Likewise, the long-term (30 to 50 year) effects of exposure to ambient air in the vicinity of such mines has also never been studied.

Summary

Extreme caution should be the prudent, common-sense response to such a lack of certainty. A look at the historical record for other supposedly-innocuous substances teaches us to respond with caution to airborne particulate matter from silica sand. Tobacco, for example, was advertised as harmless by the tobacco industry for decades before an overwhelming mass of evidence finally convinced the public that cigarette smoke contributed to lung cancer. Asbestos was used for decades as a home insulator before studies finally proved that asbestos also contributed to respiratory diseases. Lead-based paint, arsenic-based fruit sprays, and polychlorinated biphenyls (PCBs) were commonplaces of daily life for decades until the toxic effects of these substances were widely realized.

We are at the earliest stage of understanding the short, mid-term, and long-term effects of silica sand mining on the health and welfare of those people who live and work within close proximity to these mines. Monitoring of mine employees is mandatory and such monitoring does not appear to

demonstrate harm to employees. These mine employees, however, are not the people who are most at risk, since they routinely wear protective clothing and are exposed for relatively short periods of time in the course of their lives. The populations most at risk from contaminated air are those who live near such mines, especially children and aged people, who may breathe this air 24 hours a day, seven days a week. We do know that low-level exposure to particulate matter that is repeated frequently for long periods of time will create serious health consequences. Our responsibility to maintain the health, safety, and welfare of the citizens of Trempealeau County dictates that we monitor air quality in the proximity of sand mines and that we regulate the density of mines within our county.

Recommendations from Air Quality Subcommittee:

AQ1. Monitor air quality for PM 2.5 and PM 10 at property boundaries of existing Non-Metallic Industrial Sand Mines that are 1 acre in area or greater AND extracting silica. In addition to air quality monitoring at the mine site, monitoring should also be done at any location where the dry product is transferred, transported and/or stored and fugitive product could be generated. The monitoring should be done according to EPA guidelines regarding placement of monitors, filter types, and allowable limits for daily and annual averages etc. Though monitoring for PM4 is not an EPA standard, sorting out PM4 can be helpful in identifying the source of the particulate, (silica,) and has been used in a cited industry study.

AQ2. Permit holders would be responsible for obtaining air quality samples every 3 days for 3 years. If daily and annual averages comply with EPA standards, the permit holder could petition the Board of Health or the Environment and Land Use Committee to reduce the frequency of sampling to every six days. Air quality monitoring at the designated sites should continue until all requirements of the reclamation plan are met.

AQ3. Permit holders would be responsible for immediately reporting any exceeded EPA standard for particulate matter at which time the Department of Land Use would review and determine if operations should be immediately suspended. The Department of Land Use could allow resumption of mining activities after all recommended remediation requirements have been met.

AQ4. The county should consider ongoing air quality monitoring at sites where vulnerable individuals live, work or attend school. This could include: schools, nursing homes, assisted living facilities that are either within ½ - 1 mile of processing/mining or along transportation (truck or rail) routes. Air quality should be monitored inside and outside of buildings where vulnerable populations may spend time.

AQ5. The county should also consider air quality monitoring in areas where there are exposed populations (eg. Residential housing) living within a 1 mile radius of 2 or more mines and/or are situated along well used transportation routes. Data collected and compiled from these sites may be considered as demonstrating a cumulative risk. The Department of Land Use can identify these areas and implement an air monitoring program. This information may also be used to inform governing bodies of the potential impact of further permitting mines in areas where more than 1 mine is already operating.

AQ6. Responsibility of installing, maintaining, compiling, analyzing and reporting data collected from these sites should be the sole responsibility of the permit holder. The county departments of Public Health and Land Use are responsible for oversight and periodic compliance review of the data. These departments should furthermore be responsible for an annual report to Board of Health, Environment and Land Use Committee and full County Board with their recommendations as information from the monitoring program comes to light and/or further scientific data are available.

AQ7. The County may impose additional fees on the industry to fund the personnel required to implement these recommendations.

References

Brown, D, Weinberger, B, Lewis, C, & Bonaparte, H. (2014). Understanding exposure from natural gas drilling puts current air standards to the test. *Southwest Pennsylvania Environmental Health Project, McMurry, PA USA.* Retrieved from http://www.degruyter.com/view/j/reveh.ahead-of-print/reveh-2014-0002/reveh-2014-0002.xml

Calvert, Rice, Bolano, Sheehy, & Sanderson (2003). Occupational silica exposure and risk of various diseases: an analysis using death certificates from 27 states of the United States. *Occupational Environmental Medicine, 60(2),* 122-29.

Collins, Salmon, Brown, Marty, & Alexeef, (2005). Development of a chronic inhalation reference level for respirable crystalline silica. *Regul Toxicol Pharmacol, 43(3),* 292-300.

Department of Health and Human Services. (2011). *Diesel exhaust particulates report on carcinogens.* 12th edition. Retrieved from http://ntp.niehs.nih.gov/ntp/roc/twelfth/profiles/DieselExhaustParticulate.pdf

Environmental Protection Agency. (2012). *Air and radiation, NAAQS.* Retrieved from http://www.epa.gov/air/criteria.html

Environmental Protection Agency. (1995). *AIRTrends summary.* Retrieved from http://www.epa.gov/airtrends/aqtrnd95/pm10.html

Environmental Protection Agency. (2013). *Clean air act requirements and history.* Retrieved from http://www.epa.gov/air/caa/requirements.html

Environmental Protection Agency. (2013). *Fast facts.* Retrieved from http://www.epa.gov/airquality/particlepollution/fastfacts.html

Environmental Protection Agency. (2013). *Particulate matter.* Retrieved from http://www.epa.gov/airquality/particlepollution/

Environmental Protection Agency. (2013). *Particulate matter, Basic information.* Retrieved from http://www.epa.gov/airquality/particlepollution/basic.html

Environmental Protection Agency. (2012). *Six common air pollutants.* Retrieved from http://www.epa.gov/airquality/urbanair/

Environmental Protection Agency. (2012). *The plain English guide to the clean air act.* Retrieved from http://www.epa.gov/airquality/peg_caa/concern.html

Harvard School of Public Health. (2006). Harvard six cities study follow up: reducing soot particles is associated with longer lives. Original publication in *American Journal of Respiratory and Critical Care Medicine*. Retrieved from http://archive.sph.harvard.edu/press-releases/2006-releases/press03152006.html

Klafka, S. (2013). *Comments on draft permit no. 12-POY-079, FTS International Proppants, LLC.* Retrieved from http://midwestadvocates.org/assets/resources/FTS%20Action%20Page%20Documents/S__Klafka_Comments_on_Draft_Permit_12-POY-079_for_FTS15march_26.pdf

Malone, P. (2014). *Report on the final results of the citizen survey on the impacts of industrial sand mining in Trempealeau County* [draft].

Meyers, V., Lee, J., & Grant, R. (2009). Silica crystalline forms. *Texas Commission on Environmental Quality.* Retrieved from www.tceq.com/assets/public/implementation/tox/dsd/final/october09/silica_crystalline_forms.pdf

Midwest Environmental Advocates, Inc. (2013). *Petition for a contested case, FTS International Services, LLC, construction permit no. 12-POY-079.* Retrieved from http://midwestadvocates.org/assets/resources/FTS%20Action%20Page%20Documents/2013-7-23_FTS_Petition_for_Contested_Case_Hearing.pdf

Minnesota Environmental Quality Board. (March 2014). *Tools to assist local governments in planning for and regulating silica sand projects.* Retrieved from https://www.eqb.state.mn.us/sites/default/files/documents/Tools%20for%20Local%20Govt%20approved%20March%2019.pdf

Occupational Safety & Health Administration. (n.d.). OSHA NIOSH Hazard Alerts: worker exposure to silica during hydraulic fracturing. Retrieved from https://www.osha.gov/dts/hazardalerts/hydraulic_frac_hazard_alert.html

Pierce C. (n.d.) *Particulate and silica health risk research.* Retrieved from www.uwec.edu/CONHS/programs/enph/silica/silicaresearch1.htm

Pierce, C., Fay, K., & Nelson, G. (2012). Fracturing sand mining and processing. *Proceedings from ISEE 2012 Conference Abstracts, Epidemiology 23(Ss)*.

Prengaman, K. (2013). Frac sand industry faces DNR violations, warnings. Retrieved from http://www.wisconsinwatch.org/2013/03/03/frac-sand-dnr-violations/

Richards, J., and Brozell, T. (2014). *Ambient PM4 crystalline silica sampling, October 2012 through December 2013.* EOG Resources, Inc. QSTI Air Control Techniques, P.C.

Trempealeau County Office of Land Management. (2013). Operational and Permitted Mines.

Wisconsin Department of Natural Resources. (2013). Air permits glossary. Retrieved from http://dnr.wi.gov/topic/airpermits/glossary.html#letterM

World Health Organization. (2013). Health effects of particulate matter. Retrieved from http://www.euro.who.int/data/assets/pdf_file/0006/189051/Health-effects-of-particulate-matter-final-Eng.pdf

World Health Organization, International Agency for Research on Cancer. (2012). *Monographs on the evaluation of carcinogenic risks to humans: Diesel and gasoline engine exhausts and some nitroarenes,* 105: 5-12. Retrieved from http://www.iarc.fr/en/mediacentre/aircrews/2012/mono105-info.php

Radon

Sub-committee members: Sally Miller, Chair, and David Larson

Background

Radon is a colorless, odorless radioactive gas that has been linked to lung cancer. Radon is an issue in well insulated homes with limited air exchange. Radon is associated with the radioactive isotope, uranium 238. When rocks have a high concentration of uranium there is a strong chance of having radon in homes. The radon enters the home through cracks in the basement floor or walls. The warm air in the basement acts as a chimney and pulls air from the soil into the home. The pathway for radon is short, generally tens of feet, not hundreds or thousands of feet.

Key Finding 1

Radiation and radon is unlikely to be caused by or increased by NMISM.

The work group reviewed information found at Department of Human Services and the United States Geological Survey to determine the level of risk faced by Trempealeau County residents from the land disturbances caused by NMISM. Additionally, Steve Okonek, Trempealeau County Extension Agriculture Agent, communicated with David Hart, a geologist from the Wisconsin Geologic and Natural History Survey about the potential for radon to become an issue in Trempealeau County with NMISM. The group's finding is that it does not appear that radon will be an issue caused by or amplified by industrial sand mining. The sand that is being mined in Trempealeau County is primarily pure silica; it is not likely to contain uranium or uranium containing rocks. Radon should not be a

problem in the mines themselves because of the absence of uranium in the sand being mined in Trempealeau County and the use of open pit mines.

One potential impact on public health from radon is if a mining operation caused cracks in a basement, which allows radon into a home that did not previously have a radon issue. This would need to be documented so it could be determined that a nearby mining operation actually caused the cracking in the basement floor or walls. Current ordinance and policies and procedures address the issue of cracking.

Recommendation

R1. No action is needed beyond what is currently in use because radon is not likely to be an issue associated with NMISM in Trempealeau County.

References

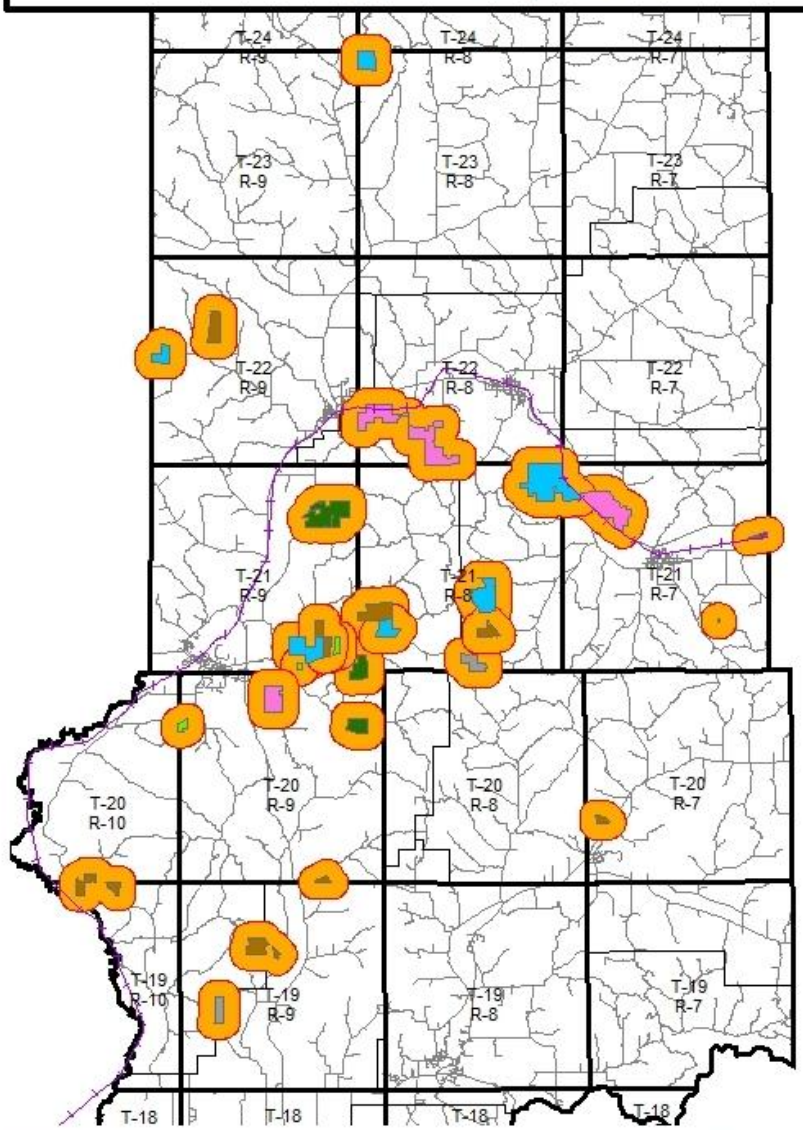
Wisconsin Department of Human Services. (2014). Geological factors of indoor radon in Wisconsin. Retrieved from http://www.dhs.wisconsin.gov/radiation/radon/GeologyPage.htm

United States Geological Survey. (1995). The Geology of Radon. Retrieved from http://energy.cr.usgs.gov/radon/georadon/3.html

Maps

Ann Hempel, Land Records Department, put together a series of maps to help illustrate a number of the complex ideas the committee was addressing in its work. These are shared in this section of the report. Also included are bicycle loops and trout streams maps.

Industrial Sand Operations
Trempealeau County, WI
November 18, 2013



Processing Operational
Extraction Operational
Annexed Operational
In Process (Processing)
In Process (Extraction)
Old Limestone Mine
Rail Loadout
2500ft Buffer
Roads

1:290,000

0 3 6 12 18 24 Miles

Trempealeau County Department of Land Management

(715) 538-2311 ext. 223 Courthouse, P.O. Box 67, Whitehall, WI 54773

N

Jake Budish

Trempealeau County
Sand Mines
August 2013

Legend

NAME

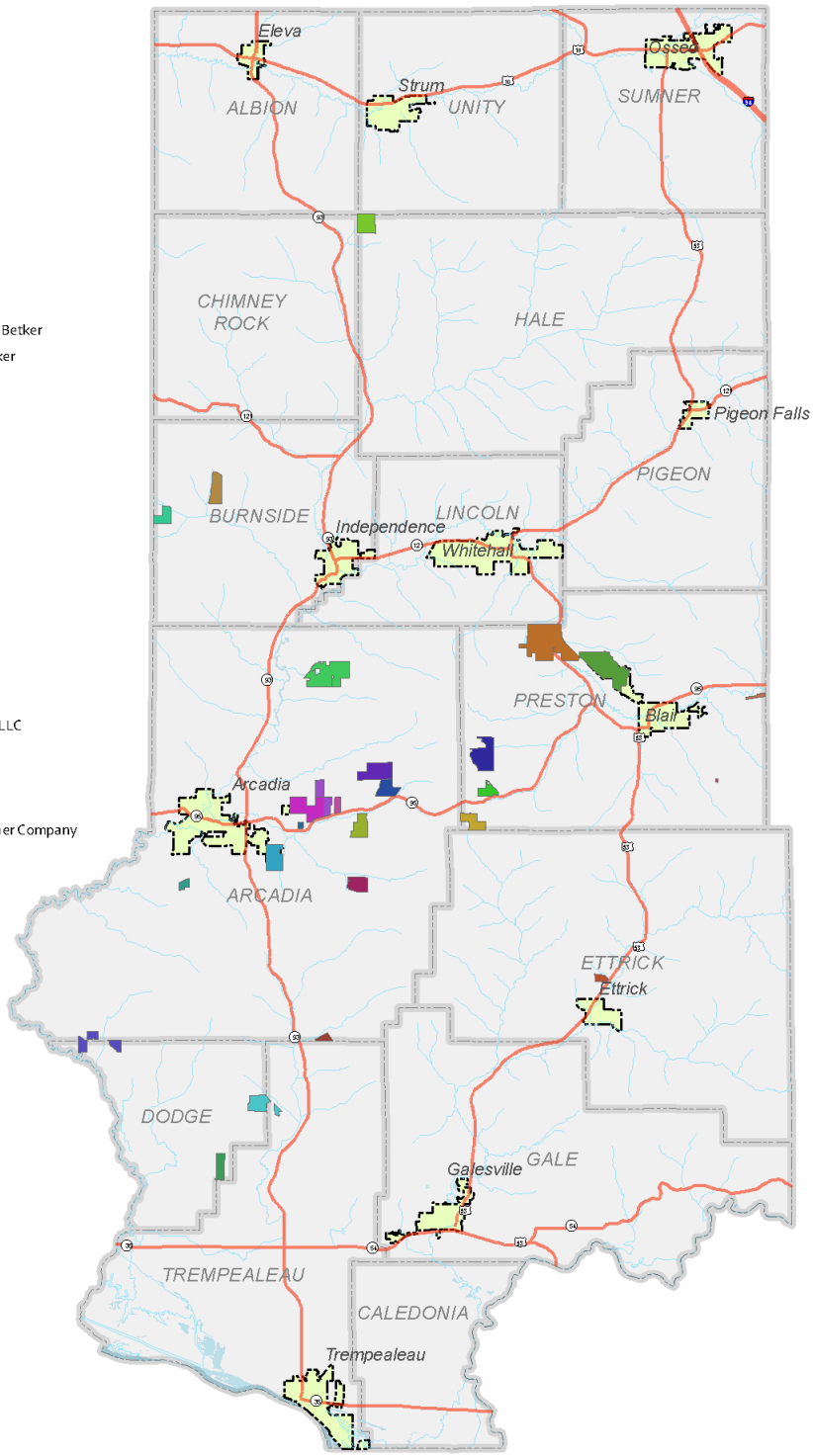
- Alpine Sands Rumple
- Arcadia Sands
- Bork Bragger 10K International
- Bue Sand Mine
- D95 North Site Spartan Sand, LLC Tenneson, Betker
- D95 South Spartan Sand, LLC Tenneson, Betker
- FTS International Services
- Guza Mine Site Cameron Rail Brannt Valley
- HWY 53-Sand Products WI LLC
- Hoesley Sand Mine B&B Sands
- Hunts Valley Prokop 10K International
- Kaw Valley Sonsalla & Pronschinske
- Konkel Lilla Sand Mine
- Patzner Sand Pit Reglin & Hesch
- Preferred Sands
- Rossa Sand Mine
- Segerstrom Paramount Sand
- Slaby Pit North Creek Sand LLC
- Soppa Sands 2
- Steve Schnieder Mine- Minnesota Frac Sand LLC
- Suchla Pit 2
- Swanson K-Frac LLC
- Taylor Frac Quarne Rail Spur
- Twesme Quarry Werlien Gilbertson TCK Kramer Company
- Weltzien Sand Mine Brant Valley
- Whistle Pass Andre Kramer

Roads

- Interstate
- US Hwy
- State Rd
- River/Stream
- Corporate Boundaries

Town Boundaries

- Town Boundaries
- Water Body



August 2013
Trempealeau County Land Records Department

Trempealeau County Sand Mines and Residents within 1 Mile

Legend

- Residents within 1 mile
- 1 Mile Radius From Mine

NAME

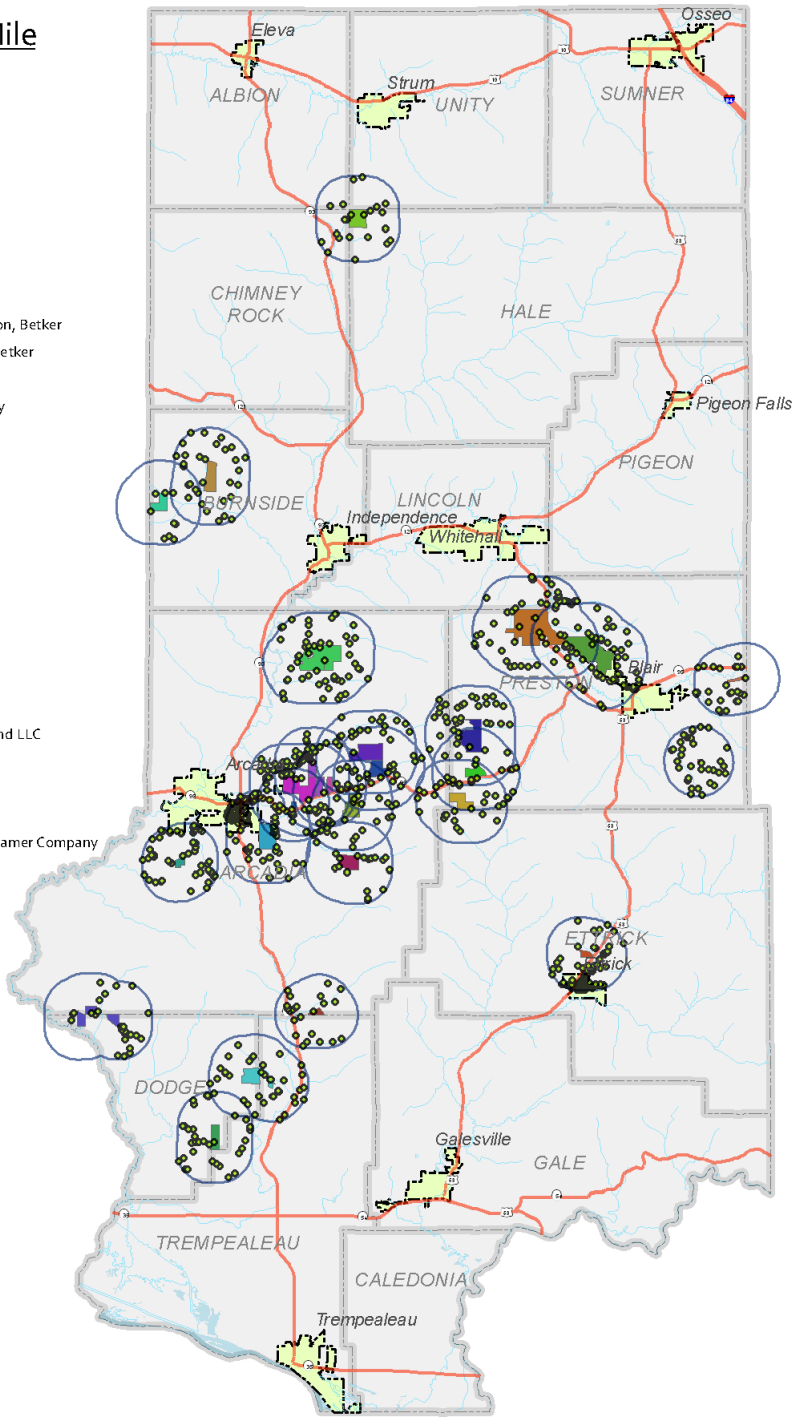
- Alpine Sands Rumple
- Arcadia Sands
- Bork Bragger 10K International
- Bue Sand Mine
- D95 North Site Spartan Sand, LLC Tenneson, Betker
- D95 South Spartan Sand, LLC Tenneson, Betker
- FTS International Services
- Guza Mine Site Cameron Rail Brannt Valley
- HWY 53-Sand Products WI LLC
- Hoesley Sand Mine B&B Sands
- Hunts Valley Prokop 10K International
- Kaw Valley Sonsalla & Pronschinske
- Konkel Lilla Sand Mine
- Patzner Sand Pit Reglin & Hesch
- Preferred Sands
- Rossa Sand Mine
- Segerstrom Paramount Sand
- Slaby Pit North Creek Sand LLC
- Soppa Sands 2
- Steve Schnieder Mine- Minnesota Frac Sand LLC
- Suchla Pit 2
- Swanson K-Frac LLC
- Taylor Frac Quarne Rail Spur
- Twesme Quarry Werlien Gilbertson TCK Kramer Company
- Weltzien Sand Mine Brant Valley
- Whistle Pass Andre Kramer

Roads

- Interstate
- US Hwy
- State Rd
- Corporate Boundaries

Town Boundaries

- Town Boundaries
- Water Body
- River/Stream



August 2013
Trempealeau County Land Records Department

Trempealeau County Sand Mines and Residents within 5 Mile

Legend

- Residents within 5 miles
- 5 Mile Radius from Mine

NAME

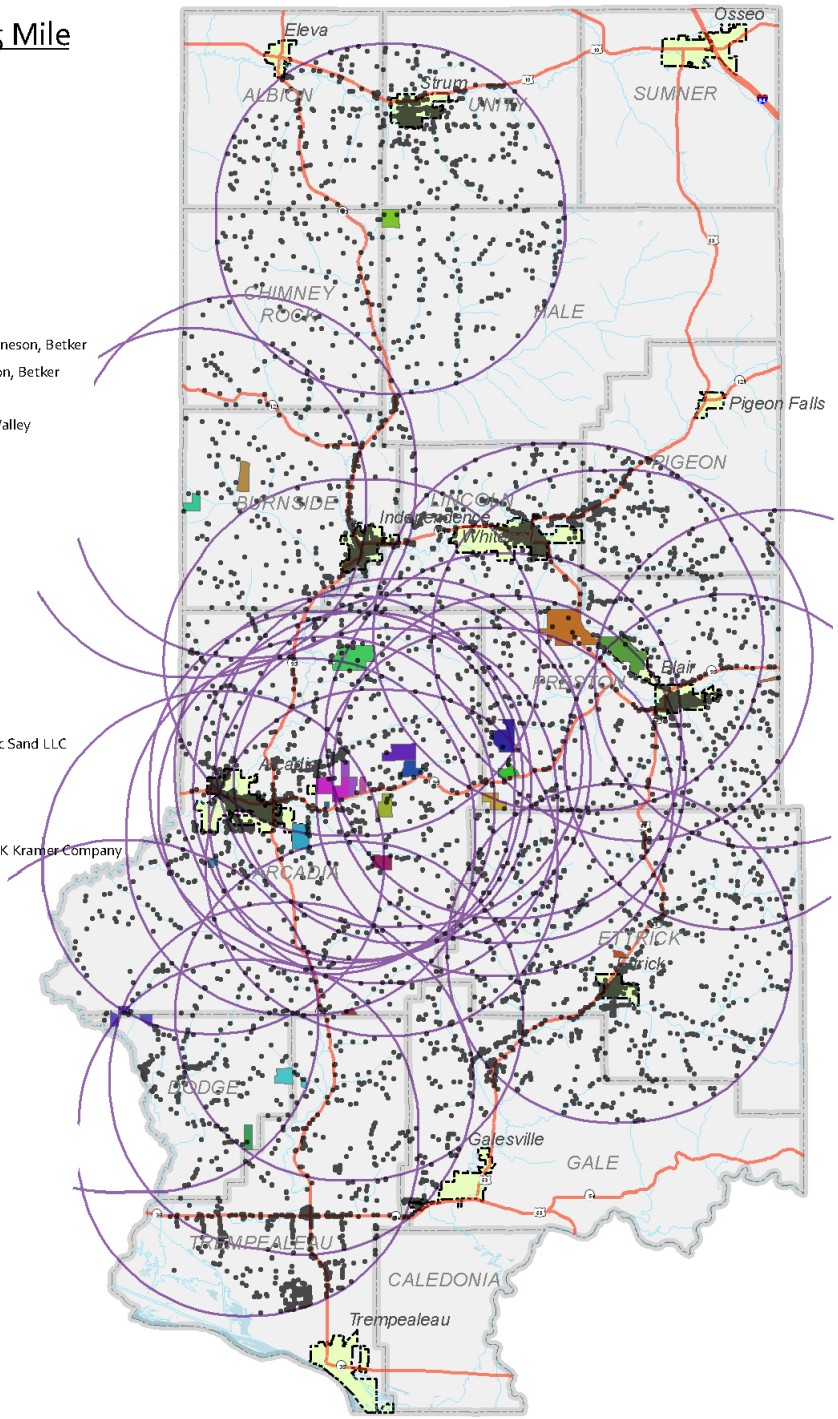
- Alpine Sands Rumple
- Arcadia Sands
- Bork Bragger 10K International
- Bue Sand Mine
- D95 North Site Spartan Sand, LLC Tenneson, Betker
- D95 South Spartan Sand, LLC Tenneson, Betker
- FTS International Services
- Guza Mine Site Cameron Rail Brannt Valley
- HWY 53-Sand Products WI LLC
- Hoesley Sand Mine B&B Sands
- Hunts Valley Prokop 10K International
- Kaw Valley Sonsalla & Pronschinske
- Konkel Lilla Sand Mine
- Patzner Sand Pit Reglin & Hesch
- Preferred Sands
- Rossa Sand Mine
- Segerstrom Paramount Sand
- Slaby Pit North Creek Sand LLC
- Soppa Sands 2
- Steve Schnieder Mine- Minnesota Frac Sand LLC
- Suchla Pit 2
- Swanson K-Frac LLC
- Taylor Frac Quarne Rail Spur
- Twesme Quarry Werlien Gilbertson TCK Kramer Company
- Weltzien Sand Mine Brant Valley
- Whistle Pass Andre Kramer

Roads

- Interstate
- US Hwy
- State Rd
- Corporate Boundaries

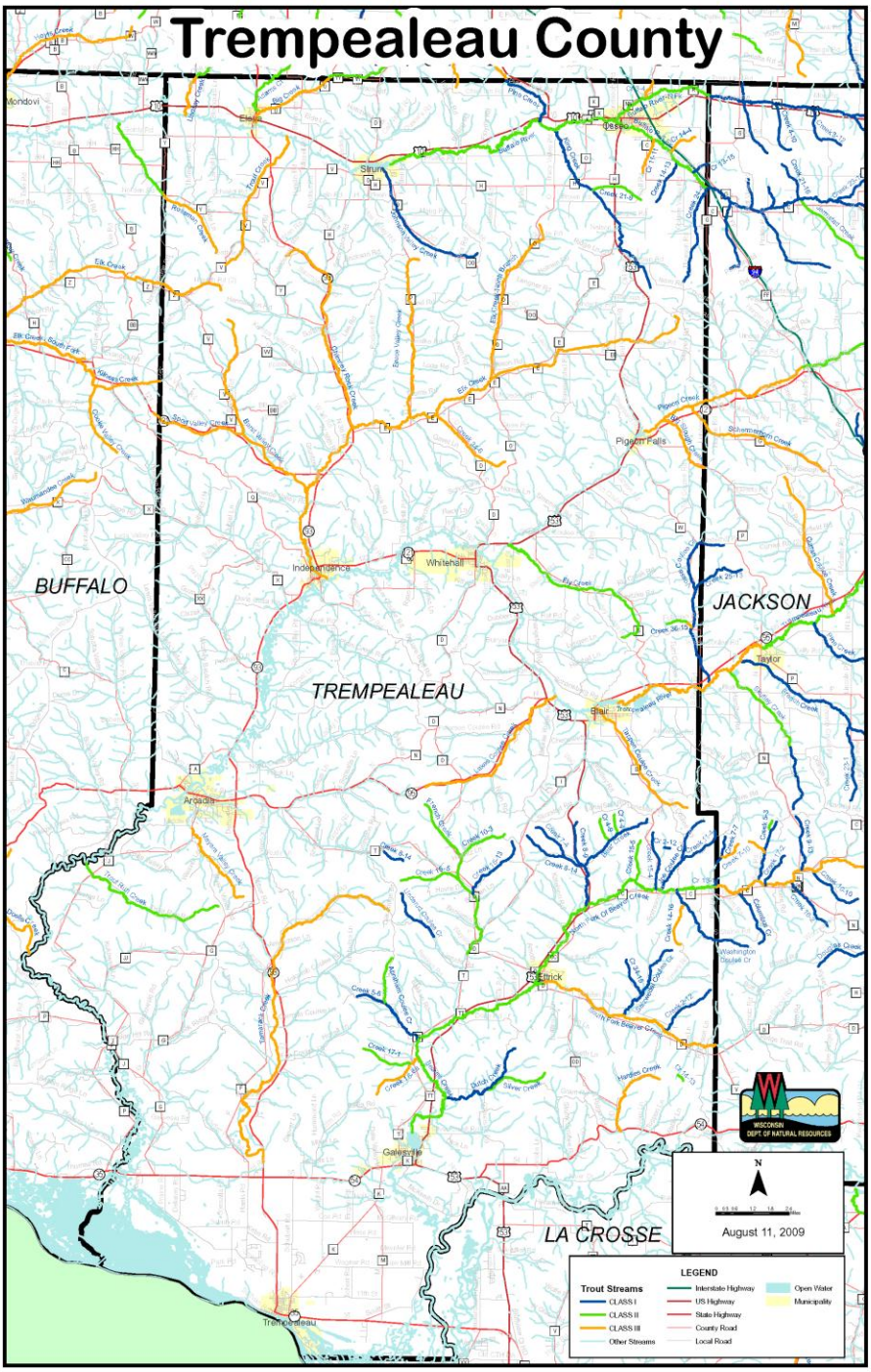
Town Boundaries

- Town Boundaries
- Water Body
- River/Stream

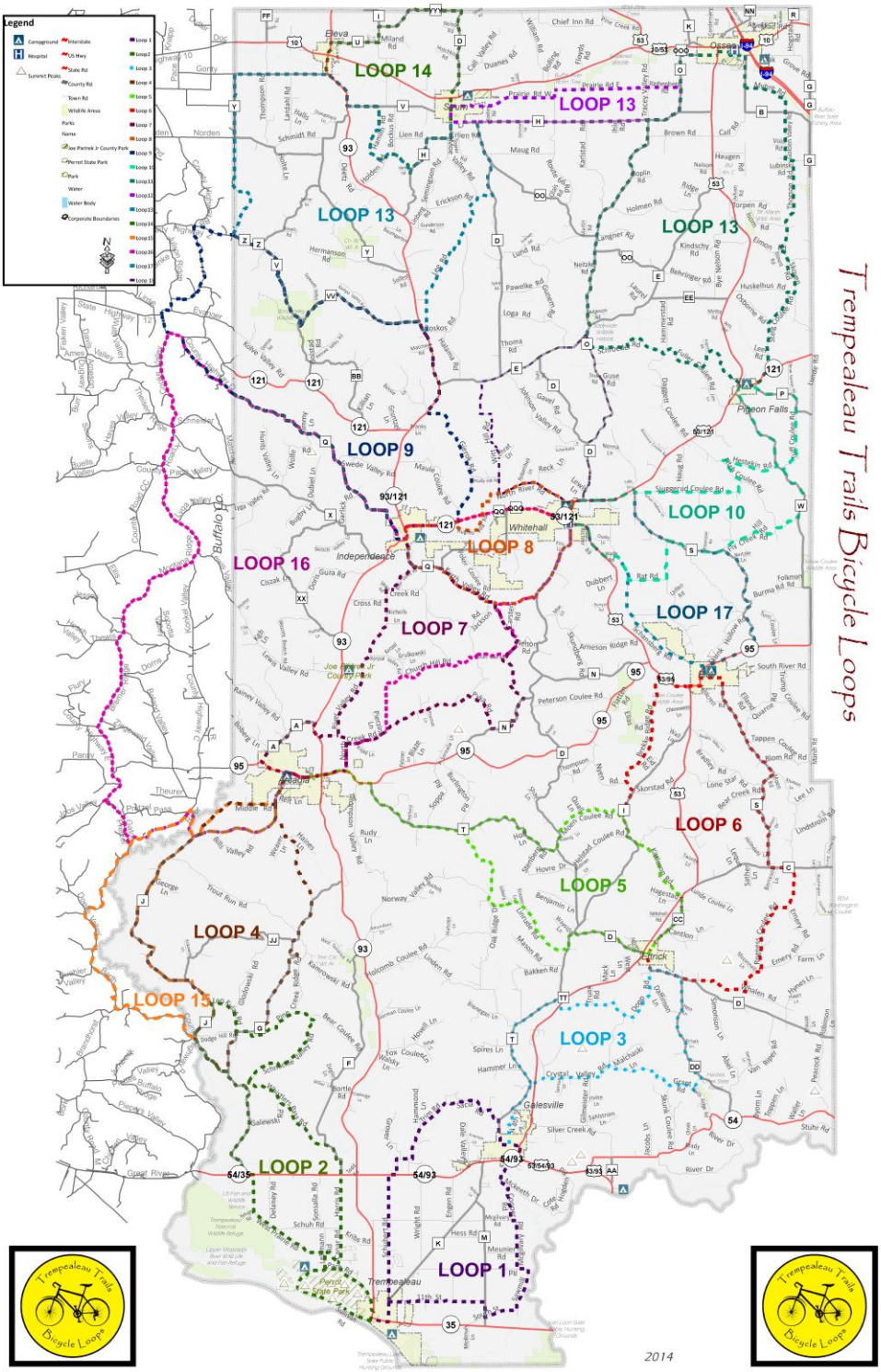


August 2013
Trempealeau County Land Records Department

Trempealeau County Trout Stream Map



Bicycle Loops Map



Appendix A: Moratorium Resolution

RESOLUTION

Moratorium on permitting of industrial sand activities in Trempealeau County

WHEREAS since 2010 a new kind of land use has begun in the county with the advent of Industrial sand mining, and

WHEREAS during the public hearing process many citizens expressed concern over the effects to air quality, water quality, quality of life, and to the ability of the county to maintain stable communities as more industrial sand mines and their processing and transportation systems are put in place, and

WHEREAS the mission of the Trempealeau County Health Department and Board of Health is to promote and improve the quality of life and health of all people in Trempealeau County through community assessment and surveillance, disaster planning and disease prevention and health promotion, in the areas of nursing, environmental health, and nutrition, and

WHEREAS the Board of Health feels it is its responsibility to consider and study the long-term effects of all of Trempealeau County's resident's exposure to higher levels of diesel fumes, fugitive silica dust, and the impact on water quality.

NOW THEREFORE BE IT RESOLVED that there be a moratorium for up to twelve (12) months, or until the appointed committee completes its final report, whichever is earlier, that prohibits the expansion of any non-metallic mining operation beyond its physical dimensions as identified in the reclamation plan on file as of the date of adoption of this resolution and further prohibits the creation of any new non-metallic mining operation during the pendency of the moratorium. The moratorium applies to all such applications for conditional use permits for non-metallic mining operations that are not filed with the Department of Land Management and deemed complete by the zoning administrator as of August 30, 2013 at 4:30 p.m.

BE IT FURTHER RESOLVED that a committee appointed by the Trempealeau County Board Chairperson be created with the responsibility to collect and analyze information and make a recommendation on whether aspects of sand mining adversely affect the public health and safety due to the effects on: water quality (including ground and surface water), light pollution, sound pollution, ambient air quality, radon release, radioactivity, and the ability to maintain stable communities; and to report back to the Trempealeau County Board of Health its findings and recommendations, as well as recommend to the Environment and Land Use Committee and the County Board possible changes to the county's ordinances, staffing, and approach to industrial sand mining in Trempealeau County.

BE IT FURTHER RESOLVED that the committee be made up of no less than eleven (11) members; that of these members, at least four (4) will be from the Board of Health, as well as three (3) citizen medical health professionals from within Trempealeau

County, the Trempealeau County Public Health Director, and three (3) citizen members; that it meets no less than 6 times; and that its budget be determined by the Board of Health, including any possible studies if any be determined necessary by the committee or Board of Health, with approval by the County Board.

Dated at Whitehall, Wisconsin this 19th day of August, 2013

Respectfully submitted,

BOARD OF HEALTH

George Brandt	Sally Miller
Jay Low	John Aasen
David Larson	Pamela Nelson
Dr. J. Selkurt	Dr. William Baxa

Appendix B: Trempealeau County Comprehensive Plan (Excerpts regarding Township Community Survey)

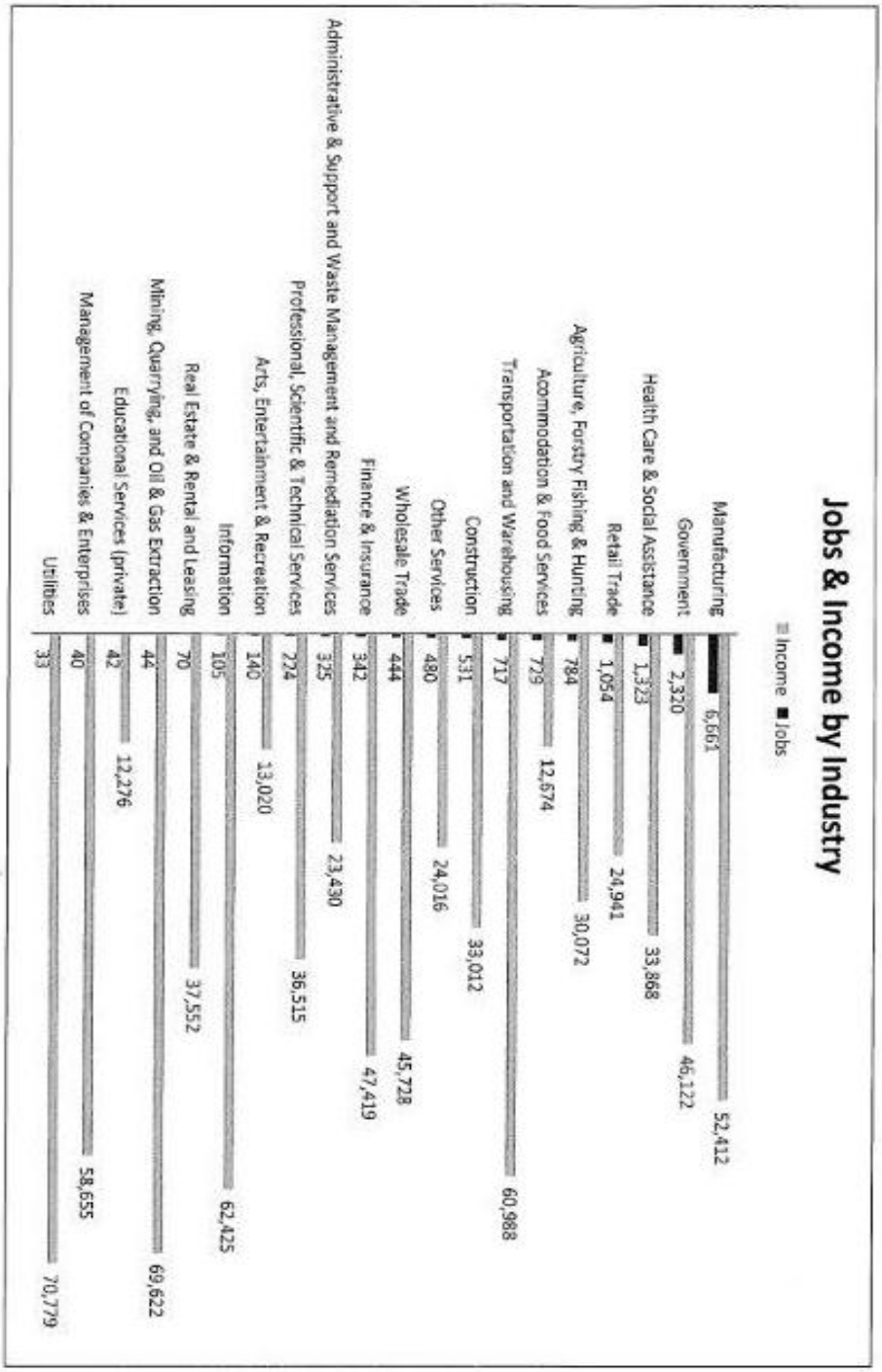
Survey Question	Average %
#1 Quality of Life affordable housing	
appearance of homes	60.9
natural beauty	78.9
near family/friends	51.9
near job	48.7
small town/rural	78.3
Other	4.1
#2 single most important live in town affordable housing	
appearance of homes	0.3
natural beauty	9.5
near family/friends	23.4
near job	10.8
small town/rural	23.3
Other	11.7
did not answer	13.4
#3 Strategies	
promote economic development	49.9
protect environment	82.5
protect drinking water	87.9
preserve scenic views and undeveloped areas	73.1
Other	7.5
#4 Top two of strategies - most important increase coor local	
promote economic development	21.1
protect environment	25.0
protect drinking water	25.5
preserve scenic views and undeveloped areas	20.6
Other	4.0
did not answer	10.7
#4 Top two strategies - second most impt increase coor local gov	
promote economic development	11.2
protect environment	29.9
protect drinking water	19.3
preserve scenic views and undeveloped areas	17.0
Other	3.3
did not answer	1.0

Appendix C. Trempealeau County Comprehensive Plan
(Excerpts regarding township-by-township responses)

Survey Question	Albion	Arcadia	Burnside	Caledonia
#1 Quality of Life				
appearance of homes	68	60	65	52
natural beauty	84	73	80	71
near family/friends	62	53	55	43
near job	50	58	57	34
small town/rural	85	74	67	66
Other	1	2	2	9
#2 single most important live in town				
appearance of homes	0	0	2	0
natural beauty	3	7	8	16
near family/friends	18	18	22	20
near job	8	11	8	5
small town/rural	16	16	12	32
Other	7	8	6	7
did not answer	41%	40	40	16
#3 Strategies				
promote economic development	46	48	63	35
protect environment	84	81	86	79
protect drinking water	84	89	94	80
preserve scenic views and undeveloped areas	74	73	69	68
Other	10	10	6	13
#4 Top two of strategies - most important				
promote economic development	18	21	27	35
protect environment	22	14	18	79
protect drinking water	21	26	29	80
preserve scenic views and undeveloped areas	22	18	14	68
other		6		4
did not answer				
#4 Top two strategies - second most impt				
promote economic development	8	14	14	36
protect environment	36	37	35	12
protect drinking water	18	18	18	9
preserve scenic views and undeveloped areas	17	15	18	19
other	3	2	2	3
did not answer				
Surveys	165	250	130	187
Return rate	46%	44%	38%	49%

Appendix D: Jobs and Income by Industry

Trempealeau County
First quarter 2014
Mississippi River Regional Planning Commission
Sorted by most jobs to least jobs by industry



Appendix E: Local narrative on hotel tourism as it relates to NMISMs

Conducted by committee member Dr. Sarah Slaby

Of our current business at Oak Park Inn in Whitehall, WI approximately 40% of our guests are true tourists. Since purchasing the inn in 1998, we have been fortunate enough thru marketing and paid memberships to encourage visitors from every continent, we have been fortunate enough to increase our business and become quite well known within the bicycling community due to the development of the Trempealeau County Trails Association.

Bicyclists are all aware of the hills of Trempealeau County due to articles published in the Wall Street Journal, Silent Sports Magazine, and Bicycling Magazine as well as numerous regional newspapers. This segment now represents 30% of our tourism visitors. These guests tend to be highly educated, upper-income, environmentally conscious professionals that are supportive of locally owned businesses. The cyclists do not cause any harm to our paved county roads, nor do they litter, or cause any disruption to the safety of Trempealeau County residents.

With the increase of frac sand mining in our county out low impact silent sport enthusiasts are very aware of the increased traffic. Usually they inquire as to which bike loops to avoid, or where they can safely ride. We have been forced to redesign several of the loops: County Road X, County Road Q, Highway 121W, and Highway 53. The original loops were designed over 14 years ago.

Groups (many of 20 or more) that would normally rebook for the upcoming year are asking if it will be safe to ride here in the future. They ask that we keep them informed of any changes, so that

they may go to another area of the state if the traffic becomes a major safety issue, which translates into loss revenue for our business.

One rider without consulting with the staff left Whitehall on loop #16. He came back to the inn very shaken, as he attempted to ride County Road X from Independence to the top of Montana Ridge. The number of sand trucks and the condition of the road caused him to come back and re-evaluate the use of the bike loop system. Every day we are redesigning loops to accommodate the bikers and avoid the mining traffic.

Below are the .05% sales tax collected and paid to Trempealeau County for the last three years. I have also provided the portion collected from lodging and food services. This figure considers the amount tourists spend on gasoline, retail, entertainment, camping and recreational services or goods.

2013 Total .05% sales tax collected and paid to county = 1,617,005.89

Total .05% sales tax collected from lodging & food services = $132,438.00 or 8.2%

2012 Total .05% sales tax collected and paid to county = 1,570,739.00

Total .05% sales tax collected from lodging & food services = $133,475.00 or 8.5%

2011 Total .05% sales tax collected and paid to county = 1,449,759.00

Total .05% sales tax collected from lodging & food services = $126,865.00 or 8.8%

Information supplied from State & Local Use Tax Report http://www.dor.state.wi.us

Question: If the hotels are all full all of the time due to mining, why has the revenue collected in 12 months decreased? (Emphasis added by Ms. Mossman)

Linda Mossman

Oak Park Inn

18224 Ervin Street, Whitehall, WI 54773, 715-538-4858, linda@oakparkinn.com

Appendix F: The Guidelines for Community Noise

Table 1: Guideline values for community noise in specific environments.

Specific environment	Critical health effect(s)	L_{Aeq} [dB(A)]	Time base [hours]	L_{Amax} fast [dB]
Outdoor living area	Serious annoyance, daytime and evening Moderate annoyance, daytime and evening	55 50	16 16	- -
Dwelling, indoors Inside bedrooms	Speech intelligibility & moderate annoyance, daytime & evening Sleep disturbance, night-time	35 30	16 8	 45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60
School class rooms & pre-schools, indoors	Speech intelligibility, disturbance of information extraction, message communication	35	during class	-
Pre-school bedrooms, indoor	Sleep disturbance	30	sleeping-time	45
School, playground outdoor	Annoyance (external source)	55	during play	-
Hospital, ward rooms, indoors	Sleep disturbance, night-time Sleep disturbance, daytime and evenings	30 30	8 16	40 -
Hospitals, treatment rooms, indoors	Interference with rest and recovery	#1		
Industrial, commercial shopping and traffic areas, indoors and outdoors	Hearing impairment	70	24	110
Ceremonies, festivals and entertainment events	Hearing impairment (patrons:<5 times/year)	100	4	110
Public addresses, indoors and outdoors	Hearing impairment	85	1	110
Music and other sounds through headphones/ earphones	Hearing impairment (free-field value)	85 #4	1	110
Impulse sounds from toys, fireworks and firearms	Hearing impairment (adults) Hearing impairment (children)	- -	- -	140 #2 120 #2
Outdoors in parkland and conservations areas	Disruption of tranquillity	#3		

#1: As low as possible.
#2: Peak sound pressure (not LAF, max) measured 100 mm from the ear.