DEPARTMENT OF NATURAL RESOURCES

# Attachments A - F

Nolte Family Irrigation EAW

04/03/2020

## Attachment A - 2019 Aerial Photos

Looking east at the project area,
view of parcel 08.009.1010 & 08.010.2020

Looking southwest at the project area,
view of parcel 08.010.3020 & 08.010.4030

## Attachment B – Natural Heritage Information Systems Correspondence

**Minnesota Department of Natural Resources**
**Division of Ecological & Water Resources**
**500 Lafayette Road, Box 25**
**St. Paul, MN 55155-4025**

October 22, 2019
**Correspondence # ERDB 20200080**

Ms. Kristina Anderson
Northwest AqwaTek Solutions
123 Jefferson Street South
Wadena, MN 56482

RE: Natural Heritage Review of the proposed Nolte Family Irrigation Project,
T136N R34W Sections 4, 9, & 10; Wadena County

Dear Ms. Anderson,

As requested, the Minnesota Natural Heritage Information System has been queried to determine if any rare species or other significant natural features are known to occur within an approximate one-mile radius of the proposed project. Based on this query, rare features have been documented within the search area (for details, please visit the Rare Species Guide Website for more information on the biology, habitat use, and conservation measures of these rare species). Please note that the following rare features may be adversely affected by the proposed project:

*Ecologically Significant Areas*

- The proposed project is partially within an area that has been preliminarily identified by the Minnesota Biological Survey (MBS) as a Site of *Moderate* Biodiversity Significance (See attached map). Sites of Biodiversity Significance have varying levels of native biodiversity and are ranked based on the relative significance of this biodiversity at a statewide level. Sites ranked as *Moderate* contain occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery. Given the ecological significance, we recommend minimizing disturbance in this area as much as possible. Indirect impacts from surface runoff or the spread of invasive species should also be considered during project design and implementation.

*State-listed Species*

- The creek heelsplitter (*Lasmigona compressa*), a state-listed species of special concern, has been documented in the Redeye River. Mussels are particularly vulnerable to deterioration in water quality, especially increased siltation. As such, it is important effective erosion prevention and sediment control practices be implemented and maintained throughout the duration of the project. If feasible, a buffer of vegetation should remain between the agricultural fields and the river.

- Booming grounds of the greater prairie-chicken (*Tympanuchus cupido*), a state-listed bird of special concern, have been documented in the NW ¼ of Section 14 adjacent to the proposed project. During the booming season, usually April 1-May 15, dozens of males gather in areas of short cover (including agricultural land), where they defend small territories and advertise to females using elaborate displays and booming sounds. After the mating season ends, the birds disperse and nest in areas of dense, undisturbed cover. Because booming grounds may move slightly from year to year, please contact the Area Wildlife Manager, Erik Thorson at 218-732-8452 x235 or erik.thorson@state.mn.us, for information on prairie-chicken activity in the area.

*Environmental Review and Permitting*

- The Environmental Assessment Worksheet should address whether the proposed project has the potential to adversely affect the above rare features and, if so, it should identify specific measures that will be taken to avoid or minimize disturbance.

- Please include a copy of this letter in any state or local license or permit application. Please note that measures to avoid or minimize disturbance to the above rare features may be included as restrictions or conditions in any required permits or licenses.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location (noted above) and the project description provided on the NHIS Data Request Form. Please contact me if project details change or for an updated review if construction has not occurred within one year.

The Natural Heritage Review does not constitute review or approval by the Department of Natural Resources as a whole. Instead, it identifies issues regarding known occurrences of rare features and potential effects to these rare features. If needed, please contact your DNR Regional Environmental Assessment Ecologist to determine whether there are other natural resource concerns associated with the proposed project. Please be aware that additional site assessments or review may be required.

Thank you for consulting us on this matter, and for your interest in preserving Minnesota's rare natural resources. An invoice will be mailed to you under separate cover.

Sincerely,

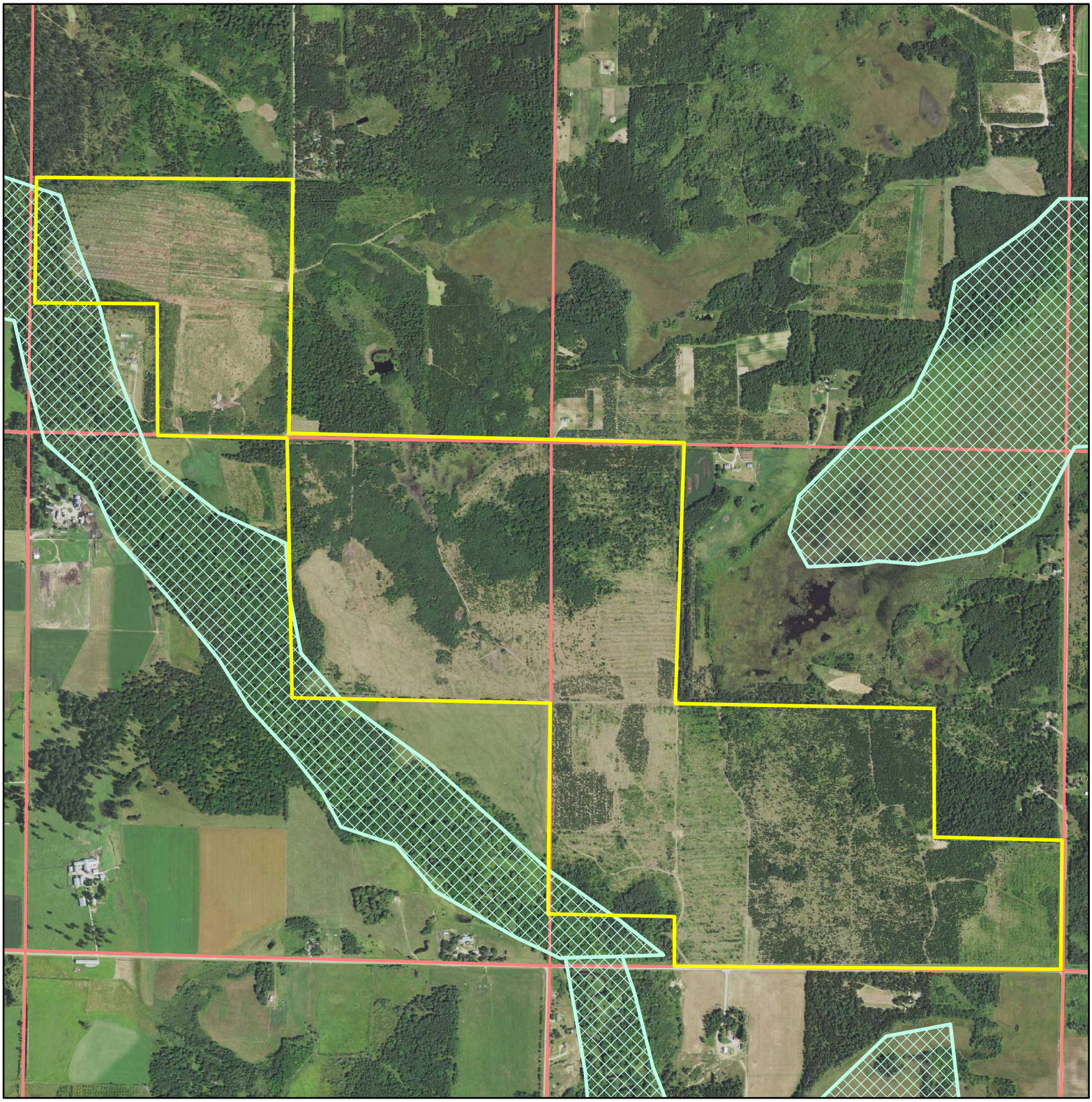
Samantha Bump
Natural Heritage Review Specialist
Samantha.Bump@state.mn.us

Enc. Map

Links: Rare Species Guide
http://www.dnr.state.mn.us/rsg/index.html
DNR Regional Environmental Assessment Ecologist Contact Info
http://www.dnr.state.mn.us/eco/ereview/erp_regioncontacts.html
MBS Sites of Biodiversity Significance
http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html

Cc: Jaime Thibodeaux
Erik Thorson

# ERDB# 20200080 - Nolte Family Irrigation Project
# T136W R34W Sections 4, 9, & 10
# Wadena County



**MBS Preliminary Sites**

- Outstanding
- High
- Moderate
- Below

- project_area_nolte
- PLS Section

0 0.1 0.2 0.4 Miles

DEPARTMENT OF NATURAL RESOURCES

Copyright 2019, State of Minnesota, Department of Natural Resources (DNR). Data was provided by State of Minnesota. These data are not based on an exhaustive inventory of the state. The lack of data for any geographic area shall not be construed to mean that no significant features are present.

## Attachment C – State Historic Preservation Office Correspondence

DEPARTMENT OF ADMINISTRATION
STATE HISTORIC PRESERVATION OFFICE

October 17, 2019

Ms. Kristina Anderson
Northwest AqwaTek Solutions
219 Bryant Ave SE
Wadena, MN 56482

RE: Nolte Family Farming Project - remove trees and stumps to clear land for irrigated crop production
T136 R34 S4, 9, 10
North Germany Twp., Wadena County
SHPO Number: 2020-0028

Dear Ms. Anderson:

Thank you for consulting with our office during the preparation of an Environmental Assessment Worksheet for the above-referenced project.

Based on our review of the project information, we conclude that there are no properties listed in the National or State Registers of Historic Places and no known or suspected archaeological properties in the area that will be affected by this project.

Please note that this comment letter does not address the requirements of Section 106 of the National Historic Preservation Act of 1966 and 36 CFR § 800. If this project is considered for federal financial assistance, or requires a federal permit or license, then review and consultation with our office will need to be initiated by the lead federal agency. Be advised that comments and recommendations provided by our office for this state-level review may differ from findings and determinations made by the federal agency as part of review and consultation under Section 106.

Please contact our Environmental Review Program at (651) 201-3285 if you have any questions regarding our review of this project.

Sincerely,

Sarah J. Beimers
Environmental Review Program Manager

## Attachment D – Pesticides Available for Use

# Nolte Farm Irrigation Project EAW
# Attachment D

Pesticides Registered in Minnesota (for Crops Proposed by Nolte Farm)

## Corn

Product Name

- AIM EC
- DELARO 325 SC
- ANTHEM ATZ HERBICIDE
- CORVUS HERBICIDE
- ANTHEM MAXX
- PROSARO FUNGICIDE
- ATRAZINE 4L HERBICIDE
- ATRAZINE 90DF HERBICIDE
- CADET HERBICIDE
- PROPULSE FUNGICIDE
- DELARO 325 SC
- LAUDIS HERBICIDE
- HARMONY SG
- SOLSTICE
- GAUCHO
- KODIAK
- BRIGADE 2EC
- CORAGEN
- BAY2000
- OBERON 2SC
- AUTUMN HERBICIDE
- BALANCE FLEXX
- AXIOM HERBICIDE
- ADMIRE
- EVERGOL
- DIFLEXX DUO
- BAYTHROID XL
- ALLEGIANCE
- DECLARE
- DIMETHOATE 400 EC
- HERO EW INSECTICIDE
- HERO INSECTICIDE
- STANZA
- ABSOLUTE MAX
- CHEMINOVA MALATHION 57%
- CHEMINOVA DIMETHOATE 4E
- MUSTANG
- TIMOREX GOLD
- FORCE 10G HL SMARTBOX
- FORCE 3G SMARTBOX
- MUSTANG MAXX INSECTICIDE
- PREVATHON
- STALLION BRAND.
- PROLINE FUNGICIDE
- KOVERALL
- PREEMPTOR SC
- TOPGUARD EQ
- CAPTURE 3RIVE 3D
- CAPTURE LFR
- ETHOS XB
- TEMITRY LFR
- METALICA
- SULFENTRAZONE 4SC SELECT
- SONIC
- CAPRENO HERBICIDE
- 42-S THIRAM FUNGICIDE
- SIVANTO 200 SL
- SIVANTO HL
- SIVANTO PRIME
- SERENADE MAX
- SERENADE SOIL
- FIERCE EZ HERBICIDE
- FIERCE HERBICIDE
- FIERCE MTZ HERBICIDE

- FLUMIOXAZIN 51% IVM
- FLUMIOXAZIN 51% WDG
- FLUMIOXAZIN TECHNICAL
- VOLLEY ATZ LITE NXT
- VOLLEY ATZ NXT
- BANVEL
- BANVEL 480
- BIFENTURE LFC-RUP

## Oats, Rye, Fescue

Product Name

- AIM EC HERBICIDE
- AIM L
- AIM-A-ABAMECTIN
- DIURON 4L HERBICIDE
- DIURON 80
- 2,4-D
- GLEAN XP
- NORTON SC
- STINGER
- GAUCHO
- PROLINE FUNGICIDE
- HUSKIE HERBICIDE
- ACCURATE EXTRA
- AFFINITY BROADSPEC
- AFFINITY TANKMIX
- ALLY EXTRA SG
- ALLY XP
- EXPRESS
- EXPRESS XP
- GLEAN XP
- CHEMINOVA MALATHION 57%
- CORAGEN
- DECLARE
- DIMETHOATE 400 EC
- MUSTANG
- MUSTANG MAXX INSECTICIDE
- PREVATHON
- STALLION BRAND
- KOVERALL
- PREEMPTOR SC
- TOPGUARD EQ
- COLT AS
- BANVEL
- CLARITY
- STARANE ULTRA
- COMET SELECTIVE HERBICIDE
- STARANE NXT
- STARANE FLEX
- SENTRALLAS HERBICIDE
- MCPA AMINE
- MCPA ESTER
- TIMOREX GOLD
- HAT TRICK THREE WAY HERBICIDE
- WELD
- EVERGOL
- IMAZAMOX 120SL
- BUCTRIL HERBICIDE
- 42-S THIRAM FUNGICIDE
- HUSKIE HERBICIDE
- MCPA AMINE
- MCPA ESTER
- 2,4-D AMINE
- BASAMID G
- VAPAM HL SOIL FUMIGANT
- ATRAZINE 4L
- ATRAZINE 90DF
- DACTHAL FLOWABLE
- DIMENSION 2EW
- ETHOFUMESATE 4SC
- SPECTICLE FLO
- SPECTICLE G
- SPECTICLE TOTAL
- ORYZALIN 4 A.S.
- XL 2G
- OXADIAZON TECHNICAL
- PRE-M 3.3 EC TURF HERBICIDE
- PRODIAMINE
- KERB 50WP

- SULFENTRAZONE
- BENTAZON 4
- VELOCITY SG
- MAESTRO
- QUICKSILVER T & O
- LONTREL TURF & ORNAMENTAL
- DICAMBA
- DIMENSION 2EW
- ETHOFUMESATE 4SC
- VISTA XRT
- RESOLVER
- KLEENUP
- SEDGEHAMMER
- MCPA AMINE
- COOL POWER SELECTIVE
- MCPP-P 4 AMINE
- MSMA PLUS
- QUINCLORAC
- Q4 PLUS TURF HERBICIDE
- CERTAINTY
- TURFLON ESTER
- CONFRONT
- TRIMEC
- SPEEDZONE
- BAYTHROID XL
- SERENADE MAX
- HARMONY EXTRA SG HERBICIDE (WITH TOTALSOL SOLUBLE GRANULES)
- AFFINITY BROADSPEC HERBICIDE (WITH TOTALSOL SOLUBLE GRANULES)
- AFFINITY TANKMIX HERBICIDE (WITH TOTALSOL SOLUBLE GRANULES)
- ALLEGIANCE

## Edible Beans (Kidney Beans)

Product Name

- F2,4-D AMINE
- DICAMBA
- PROPULSE FUNGICIDE
- GOAL 2XL
- PROLINE FUNGICIDE
- SONALAN 10G
- SONALAN HFP
- METRIBUZIN 75
- EVERGOL
- GAUCHO
- TRIFLURALIN 4E.C.
- TRIFLURALIN 10G
- TRIFLURALIN HF
- FLUMIOXAZIN 51% IVM
- FLUMIOXAZIN 51% WDG
- FLUMIOXAZIN TECHNICAL
- BENTAZON 4
- CLETHODIM 2E
- AIM EC
- AUTHORITY SUPREME
- STEWARD EC
- CERCOBIN
- KOVERALL
- BAYTHROID XL
- RHYME
- KODIAK
- ROVRAL BRAND FLOWABLE
- TOPGUARD EQ
- TOPGUARD
- CAPTURE LFR
- ETHOS XB
- COMMAND 3ME MICROENCAPSULATED
- SPARTAN 4F
- SERENADE OPTI
- SERENADE SOIL
- SPARTAN CHARGE
- SPARTAN ELITE
- BRIGADE 2EC
- BRIGADE WSB
- BRIGADIER

- CORAGEN
- DECLARE
- DIMETHOATE 4E
- EXIREL
- HERO EW
- HERO
- MUSTANG
- MUSTANG MAXX
- PREVATHON
- LEVERAGE 360
- MOVENTO
- MOVENTO HL
- SAND
- ALLEGIANCE

## Potatoes

Product Name

- TELONE II (Dow)
- ABACUS
- ABACUS V
- GEM FUNGICIDE
- REAPER 0.15 EC MITICIDE/INSECTICIDE
- REAPER ADVANCE
- REAPER CLEARFORM
- ABBA ULTRA MITICIDE/INSECTICIDE
- ABBA 0.15
- ABBA 0.15 EC
- ABBA ULTRA
- PREVICUR FLEX
- LUNA FUNGICIDE
- EMESTO
- FLINT FUNGICIDE
- ZORO MITICIDE/INSECTICIDE
- ASSAIL 70WP
- ASSAIL 30SG
- EVERGOL
- INTRUDER MAX 70WP INSECTICIDE
- ACRAMITE-4SC
- ACRAMITE-50WS
- CAPTURE LFE INSECTICIDE
- BRIGADE 2EC INSECTICIDE/MITICIDE
- FANFARE 2EC
- CONTANS WG
- BIFENTURE EC AGRICULTURAL INSECTICIDE
- SEVIN 4F
- SEVIN XLR PLUS
- CORAGEN INSECT CONTROL
- BELAY 50 WDG INSECTICIDE
- BELAY INSECTICIDE
- VERIMARK INSECT CONTROL
- BAYTHROID XL
- WARRIOR INSECTICIDE CATTLE EAR TAGS
- PROVINCE II INSECTICIDE
- PROVINCE INSECTICIDE
- SILENCER
- SILENCER VXN
- LAMBDA-CY AG
- LAMBDA-CY EC INSECTICIDE
- LAMBDA-CY EC INSECTICIDE-RUP
- MUSTANG INSECTICIDE
- MUSTANG MAXX INSECTICIDE
- TRIGARD
- DIMETHOATE 400 EC
- DIMETHOATE 400 SYSTEMIC
- VENOM INSECTICIDE
- ASANA XL INSECTICIDE
- S-FENVALOSTAR
- ZYRATE INSECTICIDE
- MOCAP EC NEMATICIDE -INSECTICIDE
- BELEAF 50 SG INSECTICIDE
- ONAGER MITICIDE
- ONAGER OPTEK
- IMIDACLOPRIDE 2F SELECT T/I
- IMIDACLOPRID 75WSP SELECT
- AVAUNT EVO INSECT CONTROL
- AVAUNT INSECTICIDE
- CHLOROTHALONIL 720

- CHLOROTHALONIL 720 SC
- CHLOROTHALONIL 82.5% WDG
- MALATHION INSECT CONTROL
- MALATHION LIQUID CONCENTRATE
- MALATHION 57%
- MALATHION 57 EC
- RIMON 0.83EC
- PERMETHRIN 13.3
- PERMETHRIN CS
- PERMETHRIN 1% POUR-ON
- PERMETHRIN 10%
- PERMETHRIN TECHNICAL
- PERMETHRIN
- PERMETHRIN TECHNICAL
- THIMET 20-G EXLOAD
- THIMET 20-G LOCK N LOAD
- THIMET 20-G SMARTBOX
- IMIDAN 70-W AGRICULTURAL INSECTICIDE
- FULFILL
- RADIANT SC
- SUCCESS OPTIM
- ENTRUST
- ENTRUST SC
- BLACKHAWK
- OBERON 2SC INSECTICIDE/MITICIDE
- MOVENTO
- MOVENTO HL
- TRANSFORM WG
- TORAC INSECTICIDE
- ATHENA INSECTICIDE/MITICIDE
- BRIGADIER INSECTICIDE
- HERO EW INSECTICIDE
- HERO INSECTICIDE
- STEED INSECTICIDE
- LEVERAGE 360 INSECTICIDE
- AZA-DIRECT BIOLOGICAL INSECTICIDE
- AZAGUARD
- ECOZIN PLUS 1.2% ME
- NEEMIX 4.5
- AZERA GARDENING
- AZERA INSECTICIDE
- AZERA PRO
- XENTARI BIOLOGICAL INSECTICIDE DRY FLOWABLE
- DIPEL 10G BIOLOGICAL INSECTICIDE GRANULE
- DIPEL DF BIOLOGICAL INSECTICIDE
- DIPEL ES BIOLOGICAL INSECTICIDE
- DIPEL PRO DF BIOLOGICAL INSECTICIDE DRY FLOWABLE
- DELIVER
- JAVELIN WG
- NOVODOR BIOLOGICAL INSECTICIDE FLOWABLE CONCENTRATE
- BOTANIGARD 22WP
- BOTANIGARD ES
- BOTANIGARD MAXX
- MYCONTROL ESO
- MYCONTROL WPO
- REQUIEM EC
- REQUIEM PRIME
- GRANDEVO
- GRANDEVO CG
- GRANDEVO PTO
- GRANDEVO ST
- GRANDEVO WDG
- KRYOCIDE
- SOLIDA
- AVAUNT
- AVAUNT EVO INSECT CONTROL
- CORAGEN INSECT CONTROL
- EXIREL INSECT CONTROL
- BOXER INSECTICIDE
- TAEGRO
- TAEGRO 2
- TIMOREX GOLD
- GLADIATOR
- CERCOBIN
- KOVERALL
- ROVRAL BRAND 4 FLOWABLE
- ETHOS XB
- ADMIRE PRO SYSTEMIC PROTECTANT
- SURROUND WP CROP PROTECTANT
- TRILOGY
- BIOCOVER MLT

# Alfalfa

Product Name

- BAYTHROID XL
- CARBARYL 4L INSECTICIDE
- CHLORPYRIFOS 4E-AG INSECTICIDE
- CHLORPYRIFOS 15G AGRICULTURAL INSECTICIDE
- COBALT
- COBALT ADVANCED
- STALLION BRAND INSECTICIDE
- TOMBSTONE
- TOMBSTONE HELIOS INSECTICIDE
- PROAXIS INSECTICIDE
- SILENCER
- EVERGOL
- SILENCER VXN
- LAMBDA T
- LAMBDA T-2
- PERMETHRIN 13.3
- PERMETHRIN CS
- PERMETHRIN 1% POUR-ON
- PERMETHRIN 10%
- PERMETHRIN TECHNICAL
- PERMETHRIN
- PERMETHRIN TECHNICAL
- BELEAF 50 SG
- CHEMINOVA MALATHION 57EC
- DECLARE
- DIMETHOATE 4E
- MUSTANG
- SIVANTO 200 SL
- SIVANTO HL
- SIVANTO PRIME
- MUSTANG MAXX
- STALLION BRAND
- STEWARD EC
- IMIDAN 70-W AGRICUILTURAL INSECTICIDE
- TRAC

# Attachment E – Pineland Sands Regional Environmental Topics

# Pineland Sands Regional Environmental Topics

## Introduction

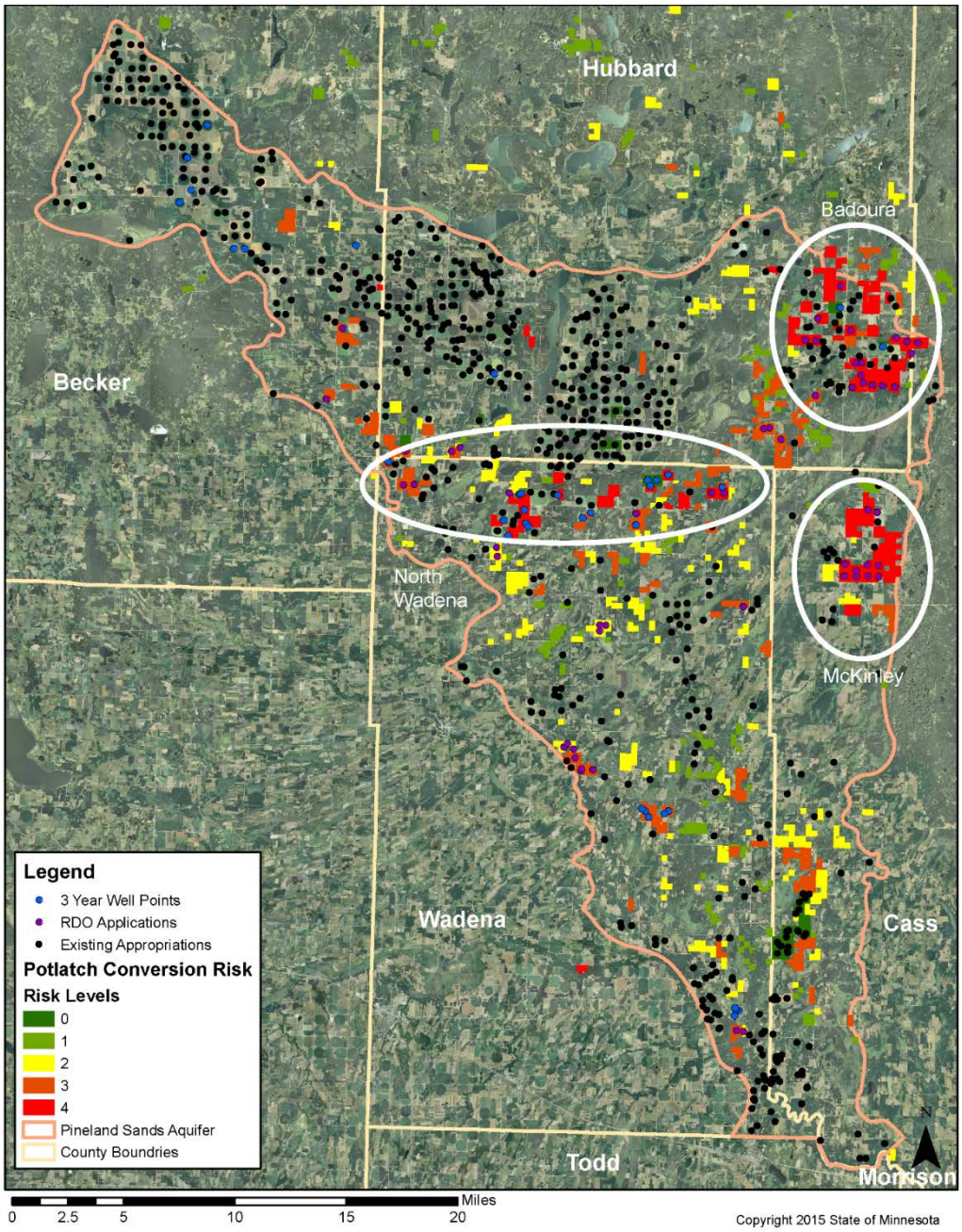
The Pineland Sands and Surrounding Area is a large regional area where the conversion of forested areas to irrigated agriculture is occurring, and some members of the public are concerned about environmental effects in this larger geographic area. This Appendix provides information about some of the environmental effects associated with this type of land conversion in the Pinelands Sands and Surrounding Area. The Department of Natural Resources (DNR) recognizes the cumulative nature of these issues are not conducive to a project specific assessment and need to be considered and addressed at a broader scale. This perspective was the basis for a 2016 DNR proposed Pineland Sands Area Special Study. Although there have been efforts to secure the needed funding for this broader study, no funding has been secured.

This information in this assessment is organized into the following topical areas:

- Pineland Sands Area Environmental Review History
- Groundwater Water Appropriation
- Nitrates in Groundwater
- Surface Water
- Habitat
- Recommendations

The Pineland Sands Area is a very large area that includes portions of four counties. The DNR convened a group of interagency technical staff from Minnesota Department of Agriculture (MDA), Minnesota Pollution Control Agency (MPCA), DNR, and Minnesota Department of Health (MDH) to develop a proposed study to inform future water appropriation and land use decisions within the Pineland Sands Area. It was acknowledged by that interagency group that the Pineland Sands Area was too large of an area for one study to provide meaningful information. This limitation was addressed in the proposed scope of the study by defining specific focus areas for data collection and analysis (See Figure E-1).

### Figure E-1 Pineland Sands Focus Area




## Pineland Sands Area Environmental Review History

The conversion of forest or naturally vegetated land to irrigated agriculture in the Pineland Sands Area has been an ongoing issue for over eight years. During this time, there has been one mandatory Environmental Assessment Worksheet (EAW) prepared by Cass County, two discretionary EAW Orders by the Minnesota Department of Natural Resources (DNR) and three Citizen Petitions for an EAW, for different projects but all on the topic of land conversion to irrigated agriculture. The Nolte Family Farm EAW, a result of the third Citizen's

Petition, is only the second mandatory EAW to be prepared on this during this time. The purpose of providing this history is to share information of how this topic has developed and efforts the DNR has taken to address the issue. An understanding of the history can provide context for recent decisions and help decision makers think critically about land conversions to irrigated agriculture in the region.

## Winnemucca Farms EAW 2012

In December of 2012 the Cass County Environmental Services Department published an EAW for an RD Offutt Company project called "Winnemucca Farms Cass County Potato Farm". The project's proposal was to convert 1,459 acres of commercial forest to irrigated agriculture land use. DNR provided comments on the EAW indicating that the document failed to assess proposed quantity of water to be used and what affect the proposal would have on area aquifers. Cass County responded to DNR's comment indicating that DNR could address those concerns as part of considering the applications for water appropriation.

As part of considering the water appropriation applications for the Winnemucca Farm project, the DNR identified a concern about how the project would affect groundwater quality, mainly from potential nitrate contamination. Part of this concern was due to limited information and data on groundwater quality and how the project would affect groundwater quality. In an attempt to address the issue the applications were approved with a condition to implement a field level study on existing nitrates in the groundwater and what the project would contribute. This requirement became a study conducted as a partnership between the Minnesota Department of Agriculture, the RD Offutt Company and Staples Community College. The study is called the Byron Township Study and is still going on today.

## DNR Discretionary EAW Orders 2015

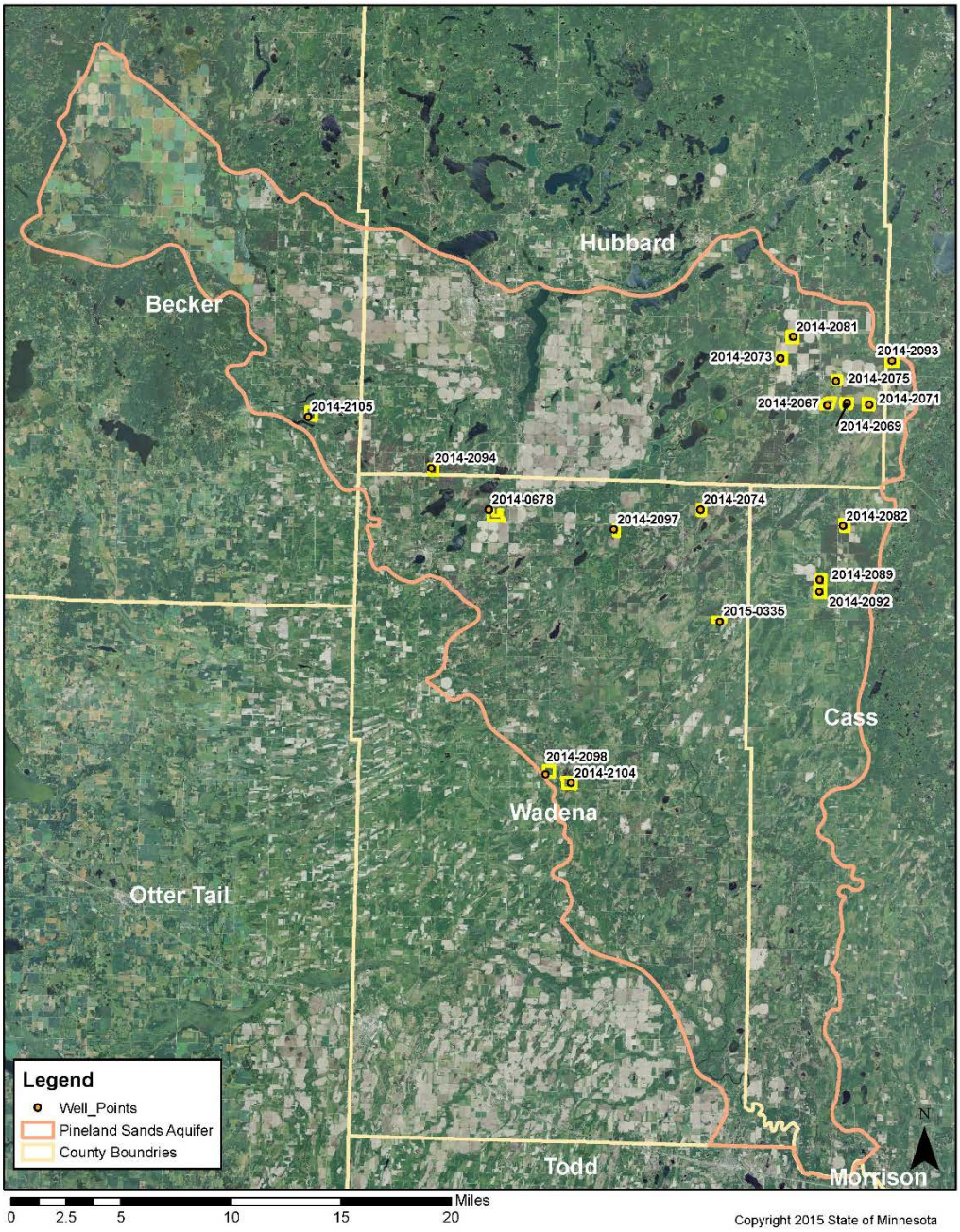
In late 2014 and early 2015 the RD Offutt Company proposed a large increase in irrigated agricultural fields within the Pineland Sands Area. The DNR became aware of this proposal through its online Minnesota Permitting and Reporting System (MPARS), when the RD Offutt company submitted twenty-one water appropriation applications and thirty-three preliminary well assessments. Preliminary well assessments are required by DNR prior to drilling a well for groundwater appropriation permits. A well must be constructed in order to apply for a water appropriation permit. This large of a proposed expansion of land conversion and water appropriation in the Pineland Sands Area raised concerns from the DNR about potential environmental effects of the land conversion.

On February 5, 2015 the DNR issued a discretionary EAW Order to the RD Offutt Company informing them that an EAW would need to be prepared for their project and that ground disturbing activities and final governmental approvals would be prohibited until environmental review was complete. The RD Offutt Company appealed this Order to the Minnesota Court of Appeals. However, before the case could be heard the company withdrew all pending preliminary well construction assessments and three water appropriation applications. As a result, the DNR petitioned the Court of Appeals to dismiss the case because the project for which the EAW was ordered had been substantially changed and the DNR needed to re-evaluate the Order in light of project changes. The Court of Appeals agreed with the DNR and dismissed the RD Offutt Company complaint.

The DNR considered the revised RD Offutt Company proposal of eighteen water appropriation applications (see Figure –E-2) and on June 19, 2015 issued a second discretionary EAW Order for the project at the reduced scale. The RD Offutt Company did not want their project to be subject to environmental review, so they engaged the

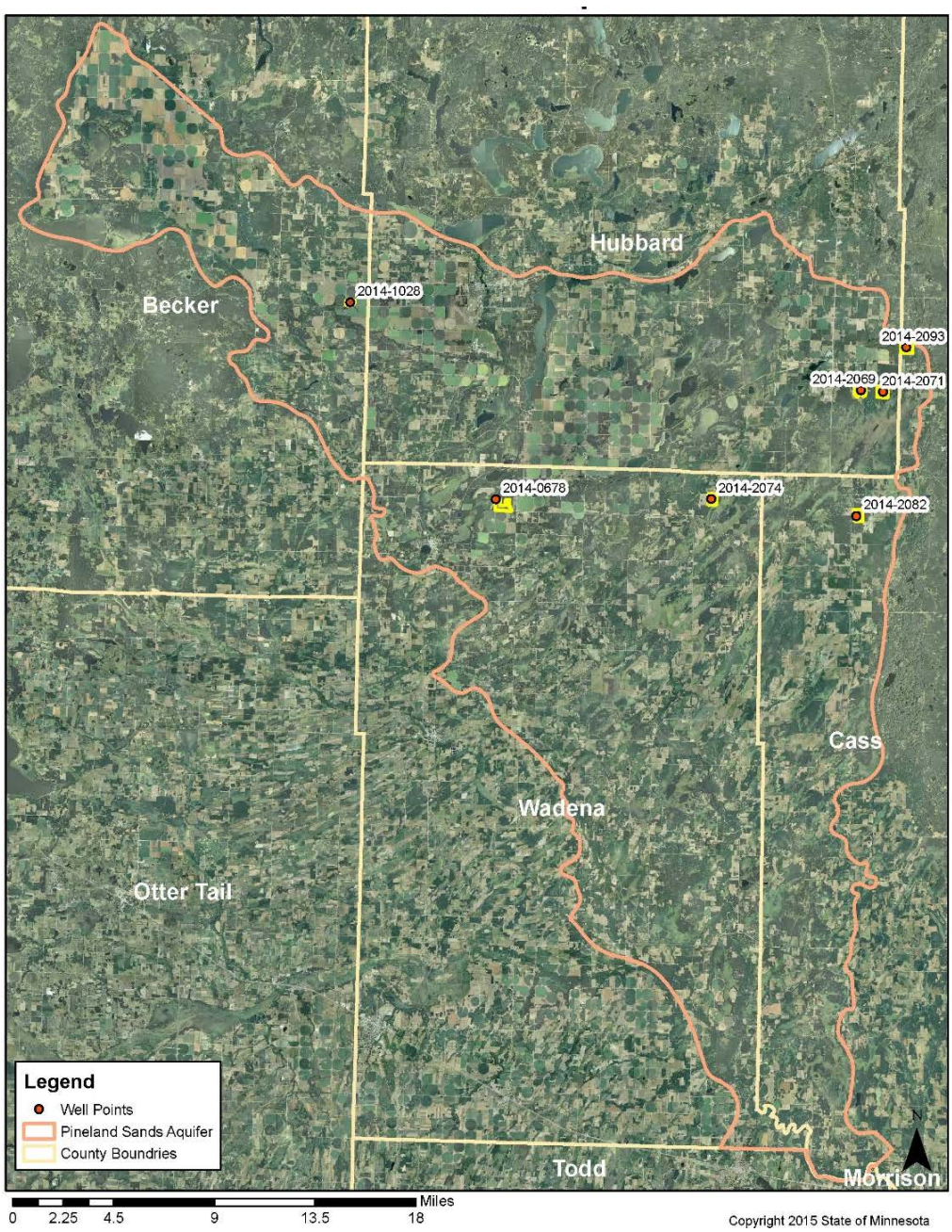
DNR to assess what scale of project they could propose that would avoid environmental review. The DNR declined to give any specific recommendation on number or location of water appropriation applications that would compel the DNR not to order an EAW. DNR did provide some general considerations that would factor into the decision, such as need for additional forest clearing, location near sensitive features, and existing density of water appropriations.

## Figure E-2 RDO Applications



In response to this feedback, the RD Offutt Company reduced their project to five water appropriation applications (see Figure E-3). The DNR reviewed the location and history of the five areas proposed for agricultural irrigation and determined that the water appropriation permitting authority was sufficient to address potential effects from the proposed, reduced scale project. Despite this decision, the DNR still had concern about additional requests from RD Offutt Company, or any other agricultural producer, that collectively could have a similar or greater impact potential to that of the originally proposed larger scale projects. To address this issue the DNR proposed a special study to gather information and make recommendations so that more information would be available to assess environmental effects of future land conversion and irrigated agriculture. The DNR used an interagency team consisting of DNR, Department of Agriculture, Minnesota Pollution Control Agency (MPCA) and Department of Health to scope out a special study that would be used for a legislative funding proposal. The RD Offutt Company agreed to participate in the study and support the legislative funding proposal. The DNR then rescinded the EAW Order and began processing the five water appropriation applications. Legislative funding of the special study was not widely supported by various interests due to concerns about public funds paying to investigate private interest proposals, the role and influence of the RD Offutt Company in the content the study, and the scope of study that was proposed. The Pinelands Sands Special Study has relevance in other portions of the History of Pineland Sands, but the study has never been funded or implemented.

## Figure E-3 RDO Reduced Request




## Citizen Petitions for an EAW

The first Citizen Petition for an EAW occurred in November of 2015 after the DNR rescinded the second discretionary EAW order. The project identified in this petition was composed of the five pending water appropriation requests from the RD Offutt Company. The DNR intended to deny this petition based on the same reasoning that led the DNR to rescind the discretionary EAW. Specifically, the limited scale of the proposed project combined with the DNR's regulatory authority and the information that would be available as a result of the proposed Pineland Sands Special Study, were all factors in the DNR's intention to deny the petition. However,

prior to the DNR providing a decision, the petitioner's representative and several other advocacy groups identified concerns about the proposed Pineland Sands Special Study. In the interest of reaching mutual agreement on how to address the Pineland Sands issue, the DNR, RD Offutt Company, and the petitioners agreed to postpone the DNR's decision on the petition. This would allow the parties to meet and discuss the study as well as potential revisions that could address these concerns. While these conversations were helpful to understanding the concerns and potential measures that could be used to address those concerns, no consensus could be reached and the DNR officially denied the citizen's petition on February 12, 2016.

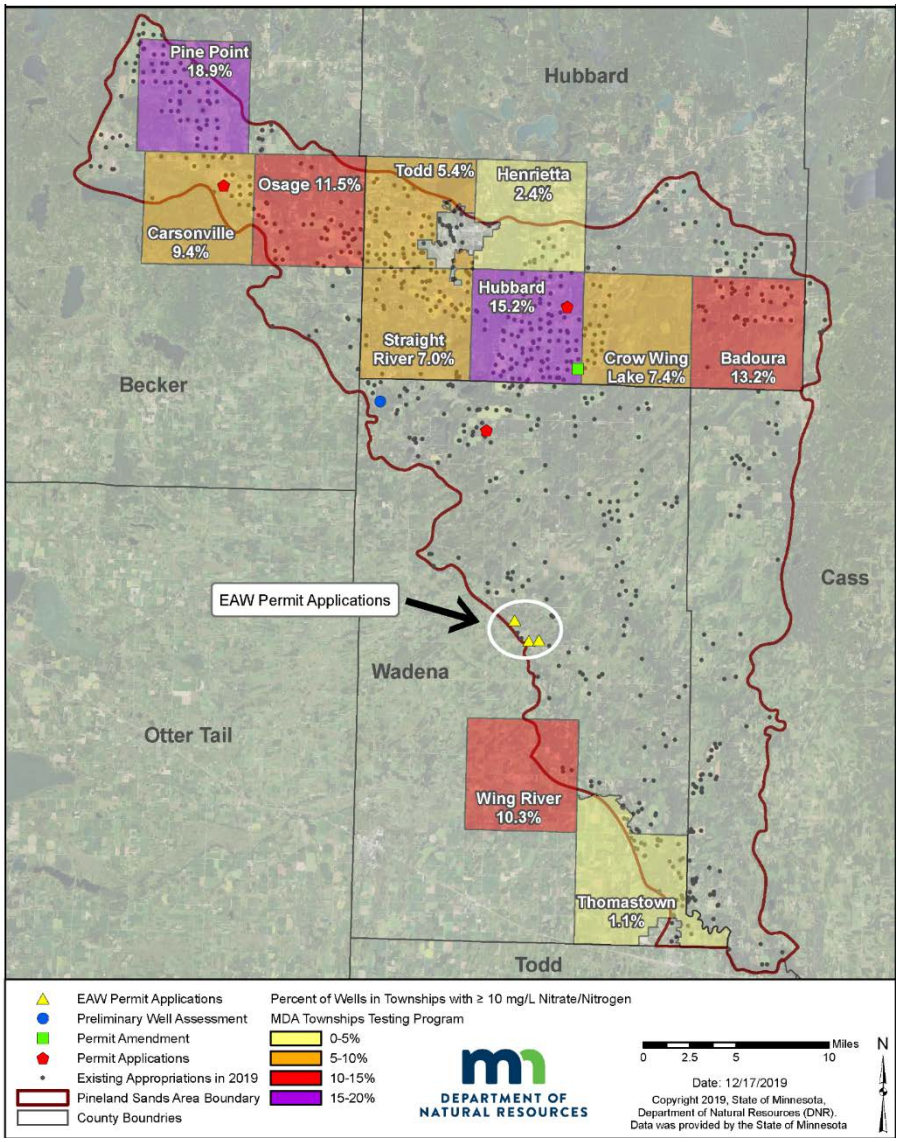
During 2016 and 2017, proposed water appropriations for conversion of land to irrigated agriculture was minimal and any specific request was scrutinized by the DNR to determine if environmental review was needed. Of importance during this time, after several unsuccessful attempts to fund the Pinelands Sands Special Study, the DNR stopped putting forth the funding proposal. Toward the end of 2017 and beginning of 2018 an increased number of water appropriation applications within the Pineland Sands Area were submitted from the RD Offutt Company as well as other producers. The DNR was concerned that these increases in land conversion to irrigated agriculture were approaching the level that prompted the June 19, 2015 second discretionary EAW Order for the RD Offutt Company's eighteen proposed wells. There was also concern that the Pineland Sands Special Study had never come to fruition. Additionally, the Minnesota Department of Agriculture's Township Testing Program had collected nitrate samples from several townships in Hubbard and Wadena Counties within the Pineland Sands Area. Some of the townships that participated in the testing program had greater than 10% of tested wells with nitrate contamination levels above the 10 mg/L drinking water quality standard.

In May of 2018 a second citizen's petition for an EAW was submitted. The project identified in this petition was RD Offutt Company's continued potato field expansions using water appropriations, forest-to-field conversions, and chemical applications in and around the Pineland Sands Area. When the DNR received the petition, the RD Offutt Company had three pending new water appropriation applications (beyond the original 5 applications that had already been approved) and four water appropriation applications for amendments to existing water appropriation permits that requested additional water volumes to establish cover crops. The DNR considered the pending applications in light of the new township testing data and lack of the proposed special study and determined the criteria in rule for ordering an EAW was met. The DNR complied with a new statutory change that requires DNR and MPCA to notify project proposers prior to ordering a discretionary EAW (Citizen Petition EAWs are defined as discretionary EAWs in the Minnesota Rules governing Environmental Review) and informed the RD Offutt Company of the DNR's intent to order an EAW in response to the petition. The RD Offutt Company responded to this notification by withdrawing the three pending water appropriation applications. This did however, leave the four water appropriation amendments subject to the petition. In the end, the DNR denied the petition based on the limited potential environmental impacts from the small increase in water volumes to existing permits. Further, the proposed water use was meant to establish cover crops, which is a recognized best management practice for increasing soil health that can in turn help prevent nitrate leaching into groundwater.

After denial of the petition, but prior to the DNR acting on the pending RD Offutt Company water appropriation requests in the Pineland Sands Area, another Citizen's Petition for an EAW was received in June of 2019. The project identified in this petition was Mr. Tim Nolte/RD Offutt Company's continued potato field expansion, forest-to-field conversions and chemical applications in and around the Pineland Sands Area. DNR confirmed with the petitioner's representative that the intent of the petition was to address any forest-to-field conversions and

chemical applications in the Pineland Sands Area, regardless of the applicant. After receiving this clarification the DNR took inventory of all pending water appropriation applications within the Pineland Sands Area and determined the only projects subject to the petition were the RD Offutt Company's four pending water appropriation amendments and three new water appropriation applications submitted by Mr. Tim Nolte (see Figure E-4). The DNR had previously decided the RD Offutt Company's proposed amendments did not justify an EAW. However, three new water appropriation requests for irrigation of 300 acres in an area that has elevated nitrate contamination in groundwater, is a strong indicator that there may be the potential for significant cumulative environmental effects from the proposed Nolte project combined with nitrate contamination that has and is occurring from other land uses in the area including irrigated agriculture. The DNR affirmed its earlier decision on the RD Offutt Company and denied the petition for that project, but approved and ordered an EAW for the Nolte project. This decision was based on the potential cumulative effect of nitrate contamination in groundwater. The EAW prepared for the Nolte Family Farm was in response to this petition.

## Figure E-4 Pineland Sands Water Appropriation Permits and Applications



# Groundwater Water Appropriation

## Hydrogeological Setting

A large surficial glacial outwash area makes up the Pineland Sands unconfined (water table) aquifer (Helgeson, 1977). The aquifer material consists of very fine sand to gravel that varies in thickness, and transmissivity. This laterally contiguous unconfined aquifer is directly connected to the area's surface water.

The surficial aquifer is underlain by glacially deposited sandy till or lake deposits. Within the sandy till are varying amounts of outwash sand and gravel. This outwash sand and gravel within the till make up the confined aquifers of the area. Lindgren (2002) has defined the confined aquifers closest to the land surface as the uppermost confined aquifers. The sand and gravel lenses range in thickness from less than 5 feet to greater than 70 feet. Locally the uppermost confined aquifers are known to produce water in sufficient quantity to allow for agricultural irrigation. Lindgren (2002) reports that the depth to the top of the uppermost aquifers range from 23 to 132 feet. Geologic cross-sections constructed for part A of the Wadena County geologic atlas (Minnesota Geological Survey, 2016) indicate that the aquifers are of limited areal extent.

These confined aquifers are separated from the surficial aquifer and each other by glacially deposited till or lake deposits. These confining units consist of sandy till deposited by the glaciers or clay or silt beds, which were deposited in the areas where lakes formed during glacial recessions (Lindgren, 2002). The confining unit closest to the land surface consists of clay till that ranges in thickness from less than 5 feet to greater than 125 feet. Boring logs from the proposed production wells indicate the presence of up to three till layers, ranging from 4 to 51 feet in thickness, likely acting as confining units for the confined aquifers beneath the site. The boring logs also illustrate two to three distinct sand lenses, ranging in thickness from 5 to 36 feet that exist between the different till layers; likely acting as confined aquifers beneath the site. Aquifer testing of wells completed in similar geologic settings indicate that the sandy tills are leaky.

## Water Appropriation – Quantities and locations

The DNR tracks water appropriation permitting using the Minnesota Permitting and Reporting System (MPARS) database. This database contains information on the water appropriation permits including location of appropriation, types of water usage, authorized amounts of water and water use reported from permittees.

Major Crop irrigation is the number one user of water in the Pineland Sands Area based on DNR permitted use data from permitted wells, estimated to be in the billions of gallons per year. The use tends to reflect precipitation trends, where dry years indicate a greater usage of water by permitted users, and wet years tend to result in lower volumes of water pumped by permitted wells. Since 1985, the trend line through the water usage data indicates an increasing use. This usage is expected to continue to increase if the use patterns match the last thirty years.

Apart from Major Crop irrigation, most permit usage categories have not shown the major increasing trends that have been seen in Major Crop irrigation. Usage in other categories is in the millions of gallons per year compared to the billions of gallons per year of use for Major Crop irrigation. Industrial processing had an increasing trend but has now leveled off over the last decade. Non-crop irrigation, like Major Crop irrigation, is tied to precipitation trends but overall does not show identifiable trends. Municipal use, such as municipal drinking water supplies,

shows a decreasing trend, particularly for the City of Park Rapids, since they have instituted some water saving measures such as replacing infrastructure, and having water conservation rates and policies.

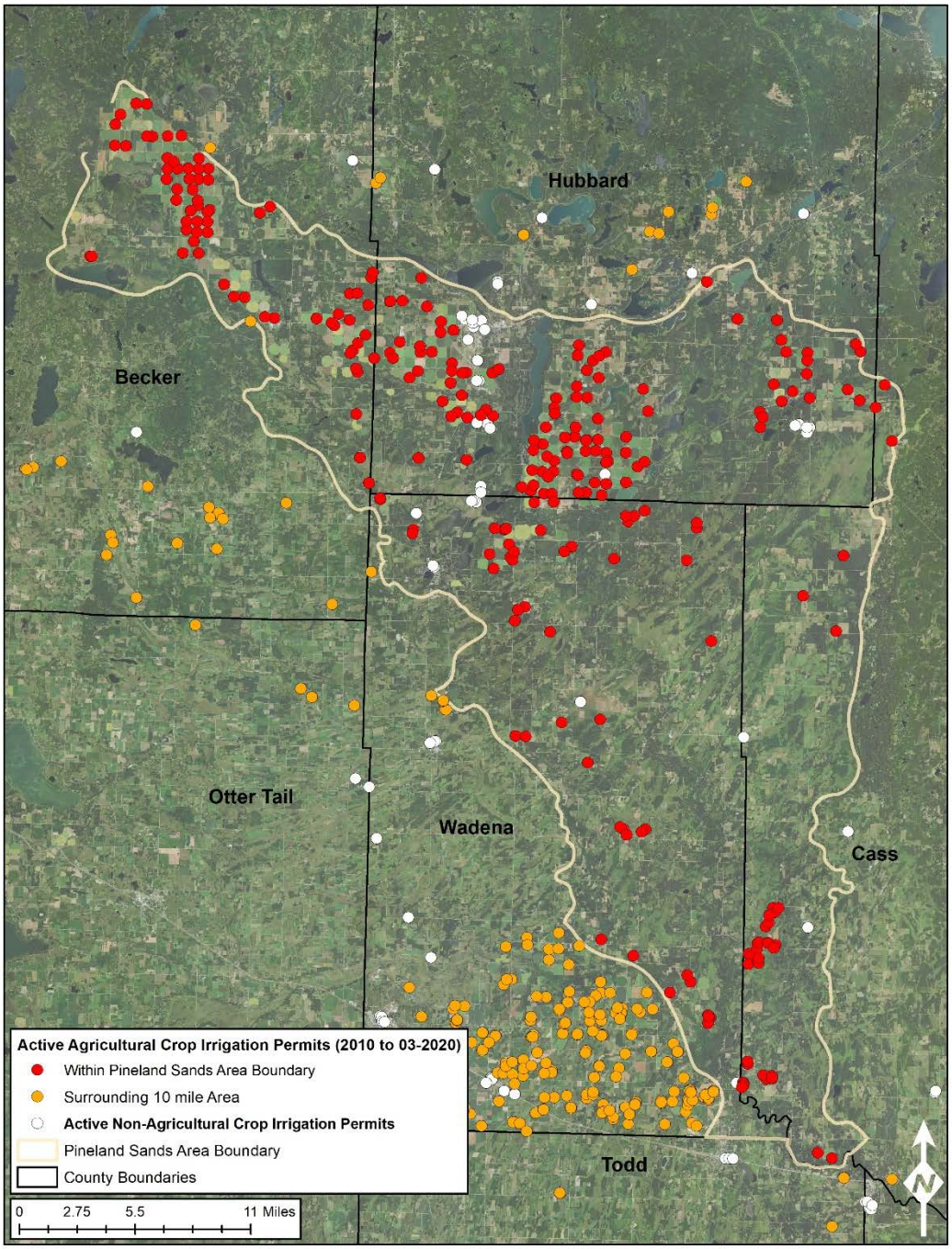
MPARS data from December 2, 2019 was used to generate the following information about permitted water appropriations within the Pineland Sands Area.

- There are 474 active water appropriation permits in the Pineland Sands Area
- 445 of those permits have use type of agricultural crop irrigation.
- 128 of these were new permits issued after 2010.
- 19,188.8 million gallons of water per year (MGY) of water are authorized for agricultural crop irrigation over 52,486 acres of farmland.
- Reported water use in has decreased over the last three years (18,102 MGY in 2016 - 9,742 MGY in 2017 - 8,360 MGY in 2018), presumably due to increased efficiency, climatic conditions, and increased accuracy in reporting.

This information verifies the observations that agricultural crop irrigation had been increasing in the area. The reason for this increase is most likely due to several different factors, some of which include increased economic value of agricultural products and reductions in economic value of commercial forestry in the area.

There is not uniform geographic distribution of agricultural crop irrigation within the Pineland Sands Area. The majority of permit locations are located in the northern or northwestern portions of the Pineland Sands Area (see Figure E-5). A specific area of increased agricultural crop irrigation is the Straight River area in the northwest portion of the Pineland Sands Area. Because groundwater is so important to this area and its use in the Straight River area has increased so much over the past 25 years, the DNR established a groundwater management area to consult with the community and to ensure that groundwater use is sustainable. Additional information on the Straight River GWMA is provided below.

## Figure E-5 Proposed Project Permit Applications




Another area of relatively dense agricultural irrigation is actually outside the USGS defined boundary of the Pineland Sands Area, but yet could be having an effect on the same resources as agricultural irrigation within the Pineland Sands Area. A search of water appropriation permits within a ten mile buffer of the Pineland Sands Area shows substantial water use in the southern portion of Wadena County in an area adjacent to, but outside the Pineland Sands Area boundary. The nature of aquifers, groundwater flow, and water use in this area indicate that

the ground water impacts inside the Pineland Sands Area may be influenced by activities outside the Pineland Sands Area boundary to the southwest.

### Straight River GWMA

The DNR designated the Straight River Groundwater Management Area (GWMA) and finalized its implementation plan March 2017. The plan currently guides the DNR's work in this area to ensure that groundwater supplies remain adequate to meet human needs while protecting lakes, streams and wetlands. This DNR recognized groundwater resources within the GWMA were at risk of overuse and degraded quality and identified the following challenges in managing groundwater appropriations within this area:

- Demand: past and projected growth in water demand, particularly for agricultural irrigation
- Natural Resources: potential for negative effects on groundwater-dependent natural resources such as wetlands, lakes, and streams
- Conservation: a need for improved and expanded application of water conservation and improved water use efficiency
- Contamination: reduction in the availability of clean groundwater
- Information: gaps in the information needed to determine the sustainability of groundwater use

The purpose of the Straight River GWMA is to guide DNR actions for managing the appropriation and sustainable use of groundwater within the geographic area. The plan describes the area, establishes a sustainability goal along with objectives, presents the DNR's current understanding of natural resources and appropriations, identifies information and data gaps and spells out specific actions by objective to meet sustainability goal.

The implementation of the Straight River GWMA is currently in year three of five. DNR staff continue to make progress on all identified actions within the plan including, a) monitoring and analysis, b) improved communications, c) support for efficient use of groundwater and d) ensure that all users comply with water use regulations and sustainability thresholds as well as other listed actions within the implementation plan.

## Nitrates in Groundwater

Information on nitrate contamination of groundwater in the Pineland Sands Area is provided from three different MDA data collection efforts and two MDH data sources. The MDA data sources in the Central Sands Private Well Network, Township Testing Program, and the Ambient Groundwater Monitoring Network. The MDH data sources are from new well construction testing and from public water supply monitoring. Each of these information sources are discussed below.

The MDH health risk limit for nitrate-nitrogen is 10 mg/L. Nitrate may naturally occur in groundwater at very low levels, generally at nitrate-nitrogen concentrations less than 3 mg/L. Elevated levels of nitrate in groundwater can come from several sources, such as septic systems, point sources from spills or industrial production and storage. Improperly installed or damaged wells can also create conduits for nitrate movement into aquifers. In areas of rural Minnesota with coarse textured soil, such as portions of the Pineland Sands Area, contributions from row crop production including manure, inorganic nitrogen fertilizer and legume crops can be a substantial as well (MDA, 2020). The MDA has developed the Nitrogen Fertilizer Management Plan (NFMP) in response to this issue. This plan is the state's blueprint for preventing or minimizing impacts of inorganic nitrogen fertilizer in

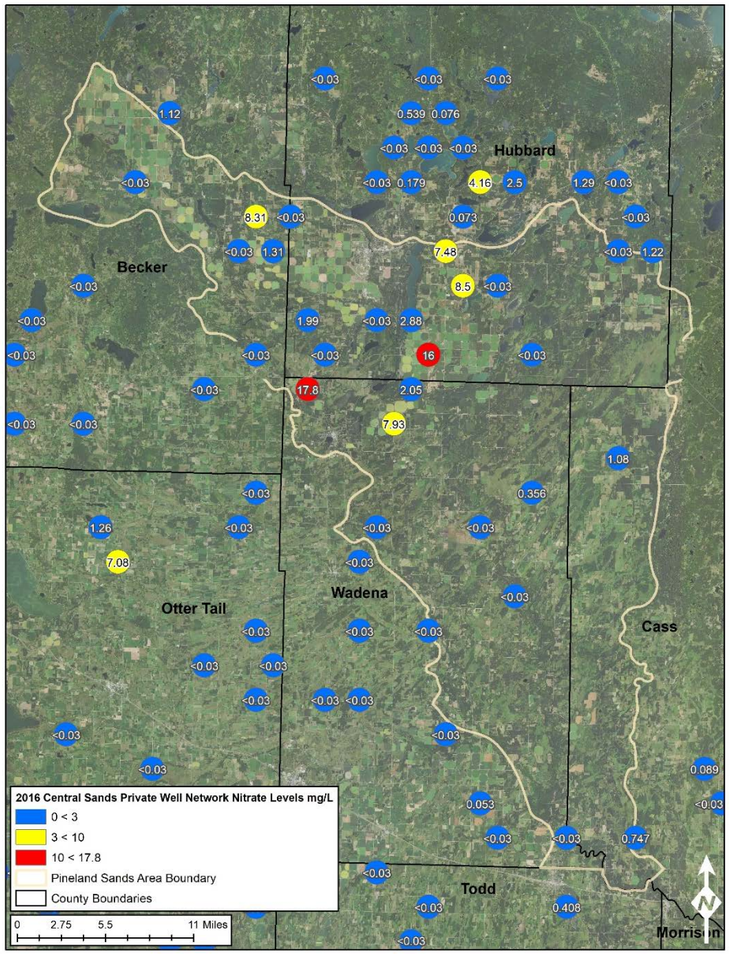
groundwater (MDA, July 2019). This plan is the foundation upon which the groundwater protection rule is based. More explanation of this rule including a weblink with additional detail is included below.

## MDA Central Sands Private Well Network

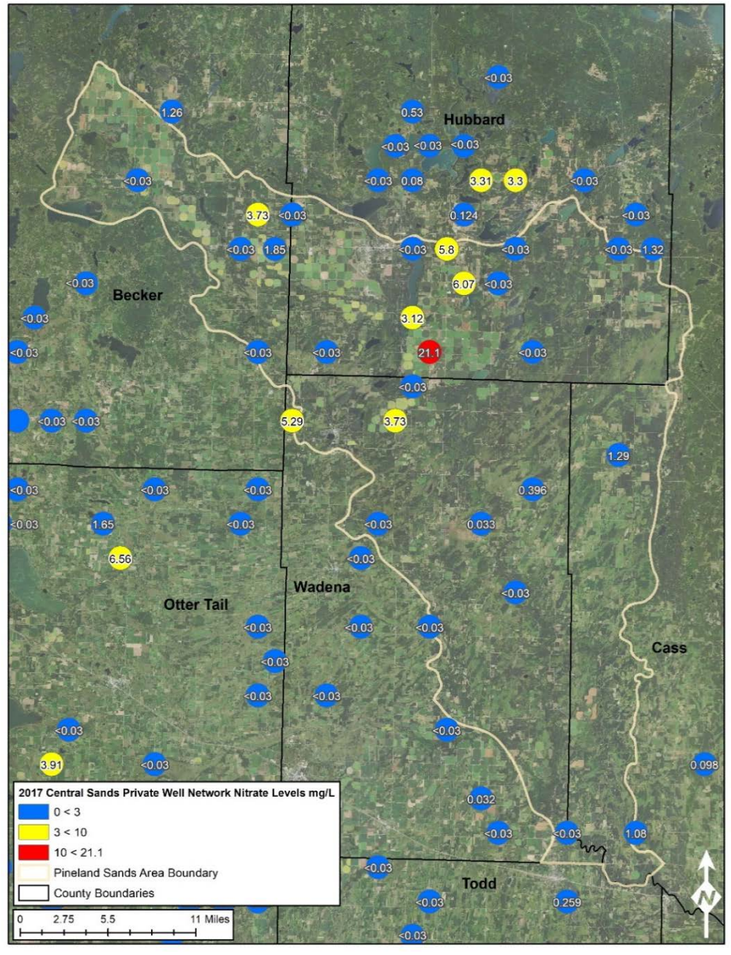
The Central Sands Private Well Network (CSPWN) was developed in 2011 due to concerns about high nitrate levels in private drinking water wells. The Central Sands region includes Becker, Benton, Cass, Crow Wing, Douglas, Hubbard, Kandiyohi, Morrison, Otter Tail, Pope, Sherburne, Stearns, Todd and Wadena Counties. As such, the scope of this network is much larger than the Pineland Sands Area, however the Pineland Sands Area is within the Central Sands region. This long term monitoring network is intended to provide a better understanding on nitrate trends in the Central Sands region to help determine if nitrate concentrations in private drinking water wells are increasing, decreasing, or staying the same. Over the eight years of data collected in this network (2011-2018) there is no statistically significant trend in the 50$^{th}$ and 75$^{th}$ percentile of data. However in the 90$^{th}$ percentile (wells with nitrate concentrations at 90% or higher than the rest) there is a slight statistically significant downward trend. A report summarizing the findings from the CSPWN can be found at the MDA's Central Sands Private Well Network webpage (MDA, 2020). The figures below provide a geographic representation of that portion of the CSPWN data that is within the Pinelands Area (see Figures E-6 thru E-8). These figures show the drop in participation that has been reported in the CSPWN results. These figures do show some areas within the Pineland Sands Area with increasing nitrate levels, and others with decreasing in nitrate levels.

## Figure E-6, E-7 and E-8

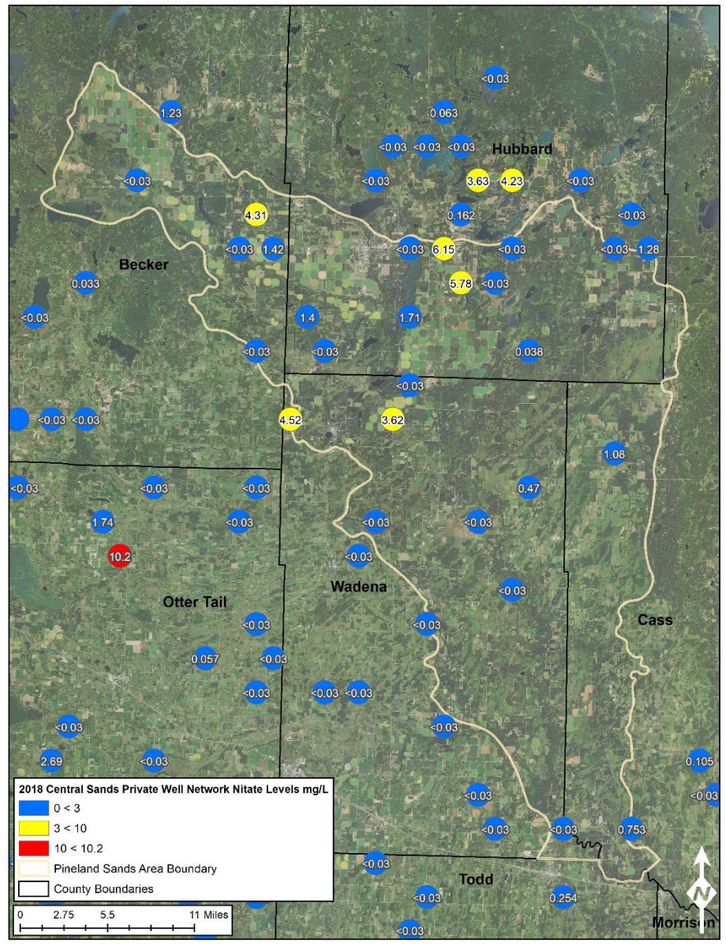
### CSPWN Results 2016




### CSPWN Results 2017




### CSPWN Results 2018

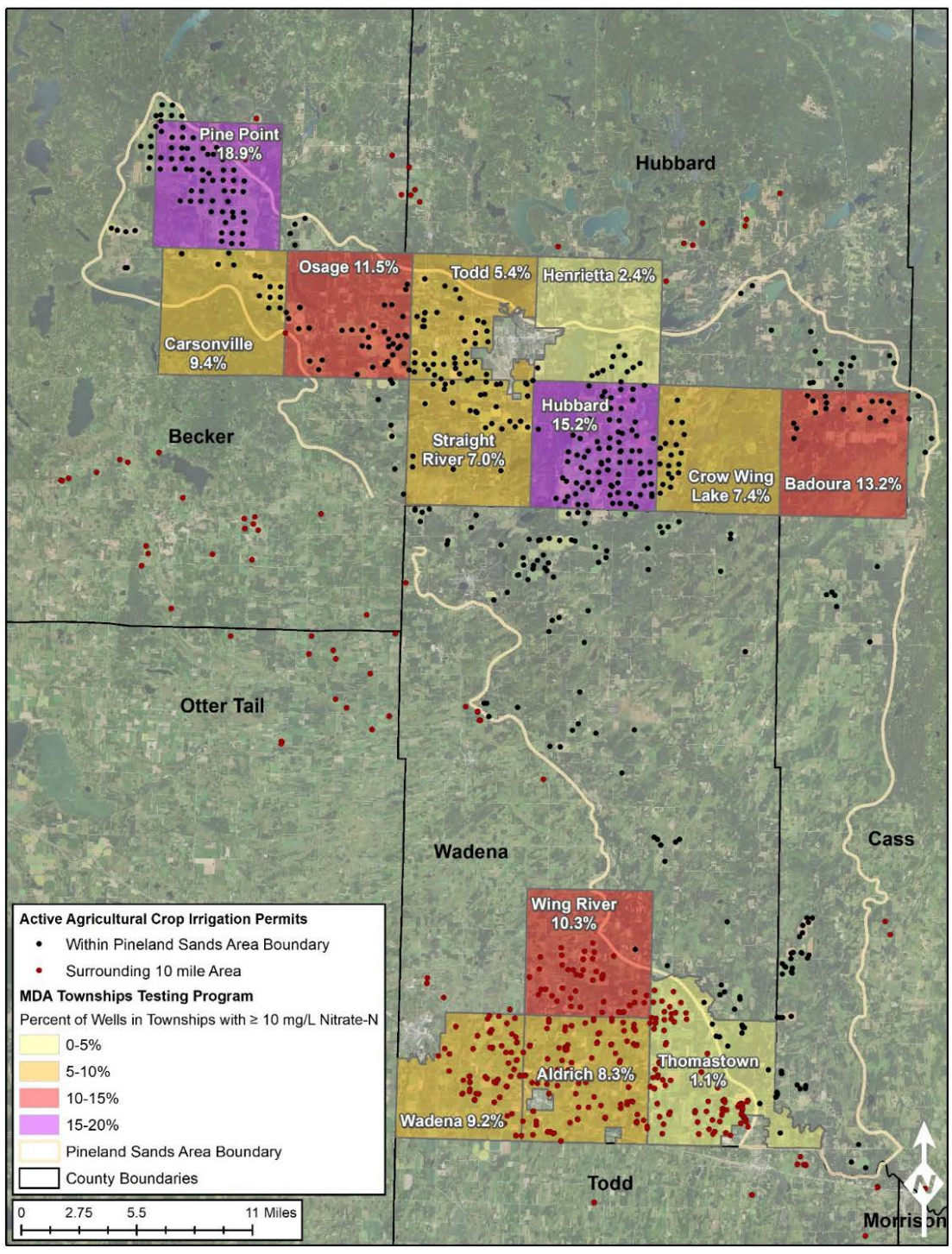


## MDA Township Testing Program

The Township Testing Program identifies townships throughout the state that are vulnerable to groundwater contamination and have significant row crop production. Each selected township is tested in a two-step process. The first step is an initial sampling conducted by homeowners that are sent a nitrate test kit. The second step is follow-up nitrate test that is conducted if the initial test detects nitrates. The follow-up nitrate test is conducted by trained MDA staff that conduct a site visit to determine if there are non-fertilizer sources of nitrate or if there are well construction problems. Homeowner participation in this program is voluntary and the resulting network from which samples are collected is not a statistically designed assessment of groundwater nitrate levels within each township. This data represents a single point-in-time snapshot of nitrate concentrations in drinking water. There are thirteen townships within the Pineland Sands and Surrounding Area that have participated in the Township Testing program (see Figure E-9). The final results from these townships are listed below by county, including the percent of wells exceeding the 10 mg/L nitrate-nitrogen health risk limit. Additional information about this program can be found at the MDA's Township testing webpage (MDA, February 2019).

| County | Township | Total Wells | % ≥ 10 mg/L |
|---|---|---|---|
| Hubbard | Badoura | 38 | 13.2% |
| | Crow Wing | 202 | 7.4% |
| | Henrietta | 254 | 2.4% |
| | Hubbard | 223 | 15.2% |
| | Straight River | 128 | 7.0% |
| | Todd | 203 | 5.4% |
| Wadena | Wing | 29 | 10.3% |
| | Thomastown | 93 | 1.1% |
| Becker | Carsonville | 29 | 6.9% |
| | Osage | 122 | 6.6% |
| | PinePoint | 32 | 12.5% |

### Figure E-9 MDA Township Test Map



Hubbard County Township testing started in 2017 and follow-up testing was completed in 2017. Wadena County Township testing started in 2013 and the follow-up sampling was completed in 2015. Becker County Township testing started in 2016 with follow-up sampling completed in 2017 and 2018.

## MDA's Ambient Groundwater Monitoring Network

The MDA's Ambient Groundwater Monitoring Network began in 1985 to provide information on impacts to the State's groundwater from the routine use of agricultural chemicals. Statewide, this network consists of shallow monitoring wells, springs, and domestic wells which are focused on the first vulnerable aquifer below the land surface in areas that have relatively large amounts of agricultural production. In Central Minnesota, monitoring wells completed in the water table aquifer are the primary source of groundwater data collected in this network. In this region, impacts on groundwater from the routine use of agricultural chemicals is likely to occur first and at the highest concentrations in this water table aquifer.

This is a long-term network designed to measure the occurrence, frequency, distribution and concentrations of agricultural chemicals in these aquifers. This information is used to guide the implementation of management practices to avoid unreasonable impacts to the State's groundwater. Using data collected from the network along with other factors such as specific pesticide use within the state and the specific chemical characteristics of a pesticide, the MDA Commissioner can designate specific pesticides as common detection. A pesticide that has been designated as "common detection" receives heightened scrutiny from the MDA during reporting of monitoring results. Acetochlor, alachlor, atrazine, metolachlor, and metribuzin are the current groundwater common detection pesticides. Pesticide specific best management practices (BMPs) are developed for these pesticides and can be seen at the MDA Pesticide Best Management Practices webpage (MDA, 2020). These BMPs provide guidance on use and application of the pesticides to reduce impacts to State waters.

The Pineland Sands Aquifer lies within the MDA's Pesticide Monitoring Region (PMR) 4. PMRs are geographical areas established by the MDA for the purposes of collecting, analyzing, and reporting water quality monitoring data. Minnesota is divided into 10 PMRs on the basis of agricultural practices and hydrologic/geologic characteristics. The PMRs follow county boundaries but are intended to generally represent different hydrologic regions in Minnesota. PMR 4 is characterized by large glacial outwash sand plains that are highly sensitive to surface activities.

The MDA produces an annual report with the results of the monitoring from the Ambient Groundwater Network. The report provides information about the pesticides detected within the state by PMR. Trend information on concentration and detection frequency for many of the pesticides by PMR is also provided. Results and trend analysis of the nitrate sampling from the network is also provided. Note that this network is not designed to understand nitrate in groundwater but provides data about nitrate in the locations of the MDA's sampling sites.

More information about the MDA's monitoring network including current and past annual reports can be found at MDA's Groundwater Pesticide Water Quality Monitoring webpage (MDA, 2020). The most recent annual report, (2018 Water Quality Monitoring Report) is available on-line (MDA, June 2019).

## Other MDA efforts Around Nitrates

### *Byron Township Study*

This project is a unique collaboration among public and private partners to study the movement and loss of nitrate-nitrogen below an agricultural field recently converted from managed timber to irrigated row crop production. The collection of water quality data began in 2014 during the first year of row crop production and has continued since that time. Both soil pore water and shallow groundwater below and around one field on this property are included in this study. The data collected from this study is intended to help researchers, agricultural industry, and government agencies better understand the potential groundwater quality impact of such land use transitions. More information on this study, including the current water quality report can be found at the MDA Clean Water Fund webpage for Byron Township (MDA, 2020).

### *Minnesota Agricultural Water Quality Certification Program*

Minnesota Statutes sections 17.9891-17.993 authorizes the MDA to operate the Minnesota Agricultural Water Quality Certification Program on behalf of the MDA, DNR, BWSR, and MPCA where each agency must honor the certification contracts with producers. MAWQCP Certification is a risk assessment and mitigation process. Applicants enter the program and verify compliance with existing laws and rules applicable to water quality such as: National Pollutant Discharge Elimination System Permits; Minnesota Wetlands Conservation Act; Subsurface Sewage Treatment System requirements; Federal Insecticide, Rodenticide and Fungicide Act; Minnesota pesticide and fertilizer requirements; or Minnesota shore land ordinances. The MAWQCP assessment process individually examines each crop in the rotation on every parcel in the operation for physical field characteristics, nutrient management factors, tillage management factors, pest management factors, irrigation management factors, tile drainage management factors, and conservation practices to identify areas that need conservation treatments. Field verification establishes that the practices and commitments of certified producers are accurate and mitigate the identified risks on every parcel through every crop in the rotation in order for MAWQCP-certification to be awarded. Audits occur randomly throughout the 10-year period of certification. More information about this program can be found at the MDA Minnesota Agricultural Water Quality Certification Program webpage (MDA, 2020).

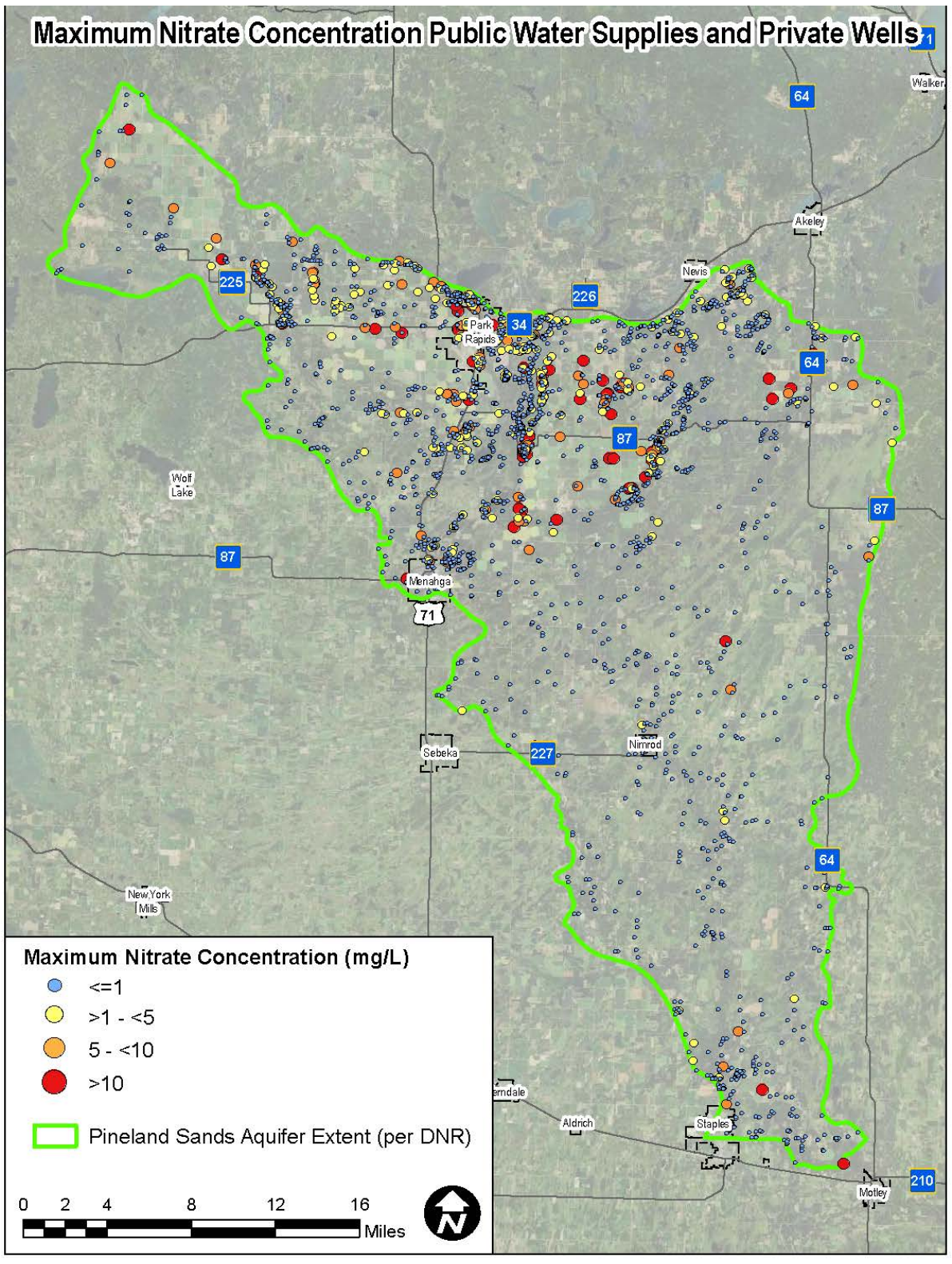
### *Groundwater Protection Rule*

The Groundwater Protection Rule is based on the Nitrogen Fertilizer Management Plan (NFMP) which is the state's plan for preventing or minimizing impacts of nitrogen fertilizer on groundwater. The Rule has two parts. Under the Part I, application of nitrogen fertilizer in the fall or on frozen soils is restricted in areas where the groundwater is vulnerable to contamination or protected areas around public wells with elevated nitrate levels. Part 2 outlines steps to reduce the severity of the problem in areas where nitrate in public water supply wells is already elevated. The rule focuses mitigation efforts on protecting public water supply wells before they exceed the drinking water standard. This part of the rule is a combination of voluntary and regulatory efforts and is designed to work with local farmers and their agronomists to find solutions that are tailored to their specific situation. More information about the Rule can be found on the MDA Groundwater Protection Rule webpage (MDA, 2020).

## MDH New Private Well Testing and Public Water Supply Testing.

MDH regulates new well construction and public water supply systems. Information from nitrate testing associated with these regulatory programs is available for the Pineland Sands Area (See Figure E-10). The geographic distribution of nitrates tests with nitrate concentrations above ≥10 mg/L Nitrate-Nitrogen would indicate that the northern portion of the Pineland Sands Area has a higher number of nitrate contaminated wells. MDH new well testing represents drinking water wells constructed according to the requirements of Minnesota Statutes, chapter 103I (MN Revisor, 2019) and Minnesota Rules, chapter 4725. (MN Revisor, 2016). Older wells constructed prior to the well code that are still in use in the area may be more vulnerable to nitrate contamination.

## Figure E-10 Nitrate Private and Public Wells




## Surface water

The Pinelands Sands Area lies within the Crow Wing River Watershed and the western portion of the Redeye River Watershed. The Pinelands Sands Aquifer area has been the focus of a substantial body of research regarding surface water contamination and vulnerability, including the MPCA's Watershed Restoration and Protection Strategies (WRAPS) studies for the Crow Wing River and Redeye River Watersheds, as well as extensive monitoring conducted on the Straight River. Because of the extensive sandy outwash in the area, groundwater and surface water are greatly interconnected. Analysis by Stark et al (1994), Helgeson (1977), LaBaugh et al (1981), Siegel (1980) and Walker et al (2009), have shown that shallow groundwater and surface water is interconnected and heavily dependent on recharge from precipitation. This interconnectedness means that pumping from one can affect the other.

### Crow Wing River Watershed

A summary of the stressors for the Crow Wing River Watershed identifies some of the lakes and tributaries do not meet water quality standards for aquatic recreation, drinking water and swimming and fishing beneficial uses. The main pollutant in this watershed is phosphorus, which can cause algae blooms in the warmer months, especially in shallower waters. Predominant human activities within the watershed that are likely leading to water quality stressors include agriculture (both crop and animal), forest harvest, and residential development. Candidate stressors for the watershed include nutrients, excess sediment, and physical barriers. Conclusions of this assessment are that the primary anthropogenic stressors were animal grazing in the riparian corridor and stream channel and fish passage barriers due to incorrect culvert placement and/or sizing. The study also identified a better understanding of the groundwater/surface water interaction are needed to fully assess landscape factors within the watershed.

The Crow Wing River Watershed contains a wide variety of land uses primarily due to its location in the state on east to west transition from forest to farmland. Row crop agriculture occurs in distinct areas such as a corridor along the Straight River west of Park Rapids. MPCA has prepared a draft nutrient study of the Straight River to better understand land use relationships to water quality. The study investigates the relationship of land use conversion from non-row crop agriculture and Conservation Reserve Program (CRP) to irrigated row crop agriculture. When this report is finalized it may provide additional information for assessment of environmental effects of land use conversion in the area.

### Redeye River Watershed

The Redeye River Watershed assessment report indicates that some streams within the watershed do not meet water quality standards for aquatic life, drinking water, and fish consumption beneficial uses. The main concerns within the watershed include low dissolved oxygen levels, excess sediment,

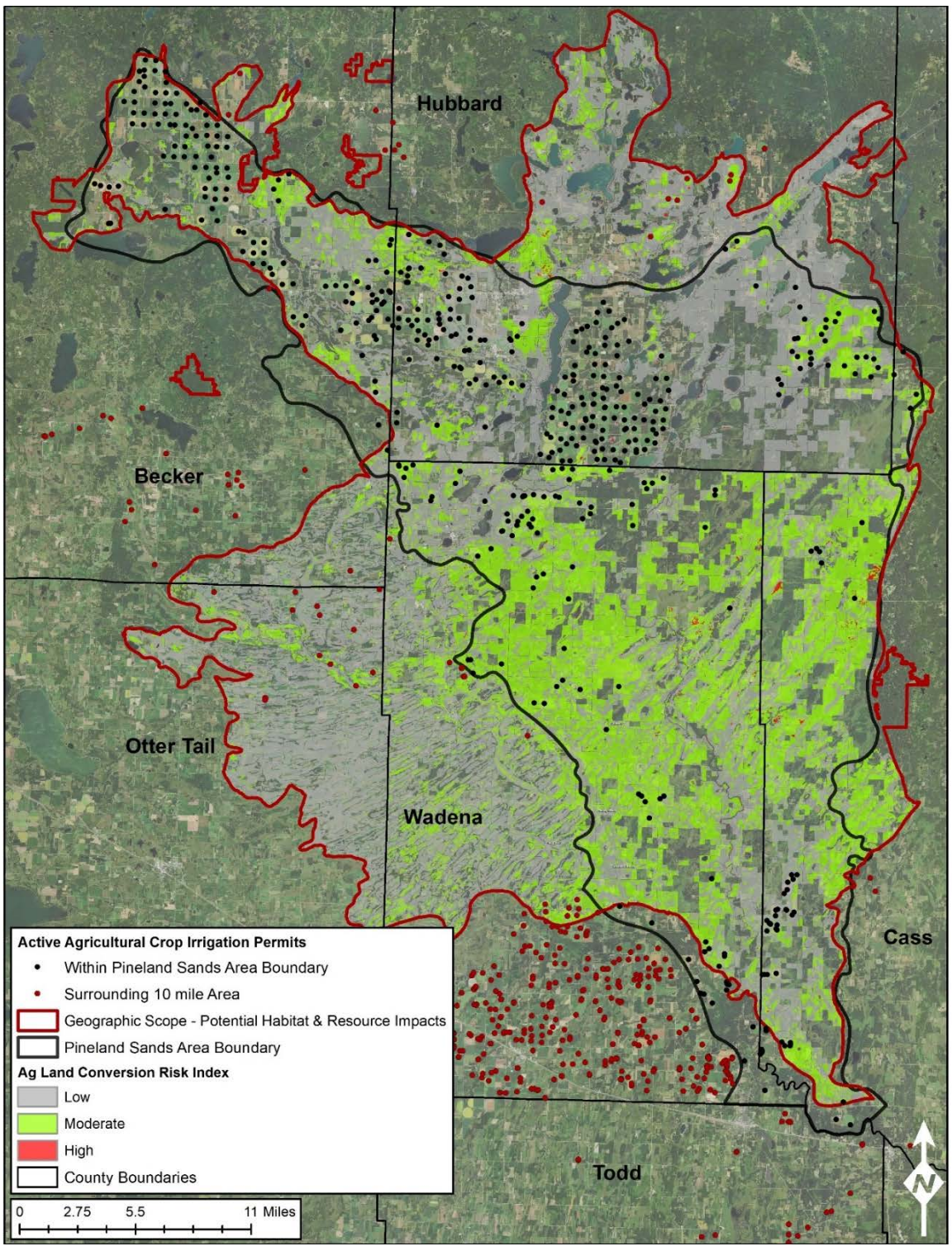
increased drainage and flow alterations, and high bacteria levels. Land conversion from forest to irrigated row crop agriculture has not been identified as a significant source of water quality concerns within the Redeye River Watershed. Recent expansion of irrigated agriculture has primarily been in the adjacent Crow Wing River Watershed.

## Habitat

The Pineland Sands Area lies within the Pine Moraines and Outwash Plains Ecological Subsection. This subsection is characterized by deep glacial deposits in outwash plains, lake plains, till plains, outwash channels, moraines, and drumlin fields. The vegetation reflects this complex surface geology and consists of both mesic forests and woodlands of jack and red pine. Peatlands, spruce bogs, sedge meadows and wetland communities are also present in areas of lake plain surface geology. An identified risk to habitat within the Pineland Sands area is the conversion of forest habitat to irrigated agriculture.

A data layer illustrating the risk of land conversion was developed in 2019 by a team in the Keeler Lab led by Christina Locke at the University of Minnesota, Humphrey Institute of Public Affairs. This data set categorizes susceptibility of forested land to conversion to agriculture on a scale of low, moderate and high risk. As is illustrated in the figure below (See Figure E-11), much of the area on the western side of the Pineland Sands and Surrounding Area is considered “low” vulnerability and large portions of the eastern and northern sides of the Pineland Sands and Surrounding Area are considered “moderate” vulnerability.

### Figure E-11 Habitat Conversion Risk




## Recommendations

The information above is compilation of the existing data that may assist in a better understanding of environmental risks with the Pineland Sands and Surrounding Area. This information alone is not sufficient to conclusively determine what actions, if any, are needed to address these environmental risks. The DNR continues to believe that potential environmental impacts from land conversion and water appropriation within the Pinelands Sands and Surrounding Area need to be addressed by a broader study, such as a Generic EIS or other study that includes intentional public engagement as part of scoping the study and sharing the results of the study. It would also be helpful to focus on specific areas within the larger Pineland Sands and Surrounding Area that are identified as being most at risk for land conversion.

Any effort to address these issues will need to include the citizen’s living in this area and it will also require close governmental coordination. The state agencies of DNR, MPCA, MDA and MDH will need to work closely with each other and with the local governmental units such as County Commissions and Township Boards to implement any meaningful change.

## Attachment F – Document References

DEPARTMENT OF NATURAL RESOURCES

# REFERENCES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