Response to Comments Provided on the Draft of the 2018-19 Iowa Nutrient Reduction Strategy Annual Progress Report

June 2020

Introduction

The Annual Progress Report of the Iowa Nutrient Reduction Strategy (NRS) is a compilation and evaluation of the work that partner organizations conduct towards the goals of the NRS—45 percent reduction of Iowa's annual nitrogen and phosphorus loads.

This is a summary of the comments received on the draft of the 2018-19 Iowa Nutrient Reduction Strategy Annual Progress Report. The Annual Progress Report, revised and published each year, provides updates on point source and nonpoint source efforts related to specific action items listed in the elements of the Iowa Nutrient Reduction Strategy. The Annual Progress Report also provides updates on statewide efforts and activities that aim to achieve reductions in nitrogen and phosphorus loads. The NRS documents, including each year's Annual Progress Report, can be accessed at www.nutrientstrategy.iastate.edu.

The draft of the Annual Progress Report was available to member organizations of the Water Resources Coordinating Council and the Watershed Planning Advisory Committee, and the comment period was open from February 27 to March 11, 2020.

This document identifies areas of the Annual Progress Report that were modified following the draft review period and presents summaries of responses to comments received.

The following organizations submitted comments on the draft report:

Page numbers referenced in the following changes and responses reflect the final, published version of the 2018-19 Annual Progress Report.

Changes to the Final Version of the 2018-19 NRS Annual Progress Report Following the Draft Review Period

As the principal organizations coordinating the NRS Annual Progress Report, the Iowa Department of Agriculture and Land Stewardship (IDALS), the Iowa Department of Natural Resources (DNR), and Iowa State University (ISU) value the comments received during the draft review period. The comments and recommendations are considered for potential revisions to the draft in question and for future improvements to NRS-related analysis and communications.

It should be noted that policy recommendations are outside the scope of the NRS Annual Progress Report. Thus, policy-related comments are always taken into consideration by IDALS, DNR, and ISU, but do not directly affect revisions to Annual Progress Report draft.

The following items describe changes that were made to the report following the draft review period. Page numbers correspond to the final version of the report, which is located at www.nutrientstrategy.iastate.edu/documents.

1. Page 20: The statement that certain cover crops estimates (both from the INREC survey and from other data sources) are "currently under review by university and public agency researchers to assess whether and how they will be included in future versions of the NRS Annual Report," was revised to, "…to assess how they will be included…". The statement, "additional measures of cover crop acres are currently being reviewed and evaluated," has been adjusted to, "…being reviewed and assessed." These changes reflect the process through which university and agency researchers review incoming and emerging data sources and subsequently develop a procedure for integrating with existing data sources for tracking progress and calculating nutrient loads.
2. Page 50 was revised to include a table of the preliminary statewide practice totals of the BMP Mapping Project for the 2010 period. In addition, the report includes an appendix with preliminary practice totals by HUC8 watershed.
3. Figure 23 was revised for clarity.
4. Page 16: The following sentence was added: "Thus, over 90% of Iowa's total land area is dedicated to some facet of agriculture."
5. Page 21: The statement, "Wetlands that treat agricultural drainage for the reduction of nitrogen export have an effectiveness of 52 percent reduction and are primarily constructed through the Conservation Reserve Enhancement Program (CREP)," was revised to, "Wetlands that capture agricultural drainage have an effectiveness of 52 percent nitrogen export reduction and are primarily constructed through the Conservation Reserve Enhancement Program (CREP)."
6. Page 36: Clarification on the justification for using centimeters as a unit for streamflow in the nitrogen load model was added.
7. Page 13: Table 11 was modified for clarity and split into two separate tables. Clarifying text was added to this section of the report to describe the content of the tables.
8. Pages 25 to 26: Figures 17 and 19 were revised to correct discrepancies in the number of point source facility permits.
9. Page26: Table 7 was corrected to report 39 construction schedules.
10. Page 46: The section describing the Conservation Infrastructure (CI) initiative was adjusted to a more abridged format, and the CI annual report was added as an appendix to provide more details and information.

11. Page 13: The NRS Farmer Survey results pertaining to the Des Moines HUC6 watershed were removed due to the discovery of data management errors. The errors are promptly being rectified; results for the Des Moines HUC6 watershed will be presented in future reports.

Responses to Specific Comments

Comment regarding a report summary

- The report provides a large amount of information, yet no concise summary of the key progress metrics. It would benefit considerably from the addition of an executive summary that provides succinct yet informative details on the key metrics under the logic model to better inform readers of progress updates. To improve upon the readability and more effectively communicate the information contained in the report, we recommend additional consideration be given to how the information in this report can best be effectively conveyed to public audiences.

Response: The 2019 Annual Report will include an executive summary at the time of publication.

Comments regarding the procedures for measuring progress of the NRS

- As the official report of progress towards the 45% N and P load reduction goals of the INRS, it is concerning that the report is lacking an overall status report of progress towards INRS goals that compares current status to the 1980-1996 baseline as established by the Iowa legislature. This progress status is arguably the most important metric to report on as it represents the culmination of efforts to reduce N and P losses to Iowa waters, and without it the report falls short of informing us of the key progress metrics. We recommend that overall current progress towards the N & P load percentage reduction goals be provided by the report.
- The state has completely, and without explanation, removed reference to scenarios from the NRS science assessment. Without benchmarks and targets for the NRS, there is no other way to assess progress toward nutrient export reduction. The scenarios show how the state can actually achieve nutrient export reduction, so they should continue to be reported on, even if the outcomes are unsatisfactory.

Response: Providing overall current progress towards the nitrogen and phosphorus reduction goals as recommended is an ongoing process. The NRS Annual Report aims to compare nutrient reduction progress to the baseline time period of 1980-96. A key consideration is the ability to conduct annual accounting that can be compared from one year to the next in a reliable and consistent manner. Currently, the following process is used to work towards a complete comparison of current N and P loads against the baseline period.

1. Identify and evaluate new data sources for point and nonpoint source practices
2. Establish procedures for estimating how those practices impact N and P loads
3. Collaborate with researchers and experts to validate those procedures

This process has been conducted for point source practices, as described on pages 30 to 32. Pages 37 to 39 describe the current status of this work for nonpoint source practices, and states that, for some practices, emerging data sources are currently being reviewed and integrated. For other nonpoint source practices, there is insufficient data at this time. In addition, once a procedure is validated for estimating N and P loads from current nonpoint source practice implementation, additional assessment will be necessary to determine how frequently (e.g. annually, five-year averages, etc.) the total load should be estimated to account for annual fluctuations that may occur.

The NRS Nonpoint Source Science Assessment presents practice implementation scenarios that meet the nonpoint source goals of the NRS. These scenarios were designed for two purposes: to determine whether the goals could feasibly be met with nutrient reduction practices and to evaluate the economic costs of meeting those goals. The scenarios are examples of feasibility and scope, and do not

serve as practice implementation goals. These scenarios can be found in the NRS Nonpoint Source Science Assessment (i.e. Part Two of the Iowa Nutrient Reduction Strategy document).

There is additional work being dedicated to assessing the scenarios in the Science Assessment and updating practice effectiveness estimates to incorporate recent peer-reviewed research. For more information about relative practice effectiveness, see page 45 of the annual report.

Comments regarding the NRS baseline time period of 1980-96 and the benchmark time period of 2006-10

- The report suggests measuring current status against the 2006-2010 benchmark period, yet the Iowa legislature has established that INRS progress is to be measured against the 1980-1996 baseline. We recommend keeping all comparisons consistent with reporting current status as compared to the 1980-1996 baseline for consistency purposes.
- The report overemphasizes the benchmark period of 2006-2010. The baseline for progress measurement is 1980-1996. The Hypoxia Task Force uses this baseline, but more importantly, Senate File 512 requires this.
- The report should focus on comparing current activity with the 1980-1996 baseline; the 2006-2010 benchmark was developed for pre-INRS economic costs estimates, not for reporting or for comparison of practice adoption.

Response: The report states on page 9 that "progress of the NRS is measured against the average annual total nitrogen and phosphorus loads that occurred during the 1980-1996 time period." The benchmark 2006-10 period is utilized for context and for metrics for which there is insufficient data going back to the baseline period. The measurement project will be refined continually to account for and estimate progress that has occurred since the baseline period.

Comments regarding data used for tracking NRS funding

- Reporting on funding for NRS-focused programs should be in a separate graph from federal programs. Although the NRS estimated potential costs to achieve its stated goals, that estimate was premised on specifically targeting resources to implement practices that reduce nutrients – particularly new resources and new programs. The largest portion of the "NRS-related" funding is through the federal Conservation Reserve Program (CRP), a program that was already well-established before the NRS was adopted. CRP has multiple aims, not just nutrient reduction, and relies on voluntary sign-ups. A direct comparison of federal and NRS-focused funding is misleading due to the different goals of the programs and the scale and administration of funding.
- Reporting on funding should be put into context. Considering only conservation funding ignores production incentives that can more than offset the funding.
- Funding assessments fail to address the temporary nature of certain management practices. CRP contracts last 10 or 15 years, after which the land may be re-enrolled or may return to row crops. Looking at CRP funding without accounting for the net change in CRP funding ignores this fact. In 2018, Iowa had 158,395 acres of expiring CRP. Cumulatively, the state will have over 1 million acres expiring between 2020 and 2030. Annual expiration amounts vary significantly and should be included in the annual report when considering the funding for CRP. This also reflects the variability in CRP funding, over which the state of Iowa has no control.

Response: The suggestion for displaying different funding sources in separate graphs will be considered for the 2020 NRS Annual Report. The existing funding analyses aim to capture all sources of funding that contribute to advancing the goals of the NRS and display the changes within these categories over time.

The Annual Report aims to measure and track efforts that directly pertain to nutrient reduction in Iowa. While an important consideration, federal crop subsidies are outside the scope of the NRS progress metrics. At this time, the effect of the availability of subsidies on conservation practice adoption is unclear and may be excessively complex. The report tracks corn and soybean acres over time and other land use considerations, which can be found on pages 16 to 18.

In response to the comment on the temporary nature of some conservation practices, there are two ongoing efforts that aim to address the differential lifespans of nutrient reduction efforts. First, analysis is currently being conducted to assess the longevity of existing funding sources, based on administrative data from state and federal agencies and based on the data provided by partner organizations (see Part Three for reports submitted by partners). Programmatic changes to funding sources are reflected in the report each year. Second, analysis of land use change beyond just CRP acreage is displayed on pages 16 to 18. Past annual reports have focused on CRP acres as the primary metric for tracking land use change (see the "Land" section of past annual reports). In response to the fact that CRP acreage accounts for a relatively small portion of the overall land dedicated to pasture and perennials, the 2019 NRS Annual Report has shifted to evaluating all pasture, perennial, and extended crop rotations using remote sensing data. These acreages are assessed based on net change over time and the associated impact on nutrient loads. This metric will continue to be developed and refined in the future.

Comment regarding farmer knowledge of and attitudes towards the NRS

- The lack of changes in knowledge and attitudes is disappointing and should result in changes to implementation strategies. The fact that a quarter of farmers surveyed claim not to be very familiar with the NRS and there was minimal to no change in attitudes toward the NRS (with no articulation of what these baseline attitudes are) suggests that education efforts are not adequate to result in behavior change and broad implementation of conservation practices.

Response: As analysis of the NRS Farmer Survey continues, the suggestions for expanding the analysis and informing future outreach efforts will be taken into consideration. ISU researchers are conducting research to better understand the factors that facilitate or present barriers to conservation adoption. Page 14 describes findings from a study that explored factors that impact cover crop adoption; similar quantitative social research that utilizes data from the NRS Farmer Survey is ongoing, and results will be highlighted in future annual reports as they become available. In addition, the Iowa Nutrient Research Center has funded several research projects related to social sciences and communications in the last two years. It may be unrealistic to expect underlying social-psychological factors such as attitudes to shift at the population level within a few years' time. The aforementioned studies aim to assess social change at smaller geographic scales, such as communities and watershed projects, using data from the NRS Farmer Survey and other data sources.

Comment regarding land use information

- Page 20 last paragraph – Suggest the following addition just to give the casual reader a more impactful understanding of the role of agriculture in IA. "Land use change Iowa's land use in 2018 and historically Iowa's total land area is 35.7 million acres. The state's land is dedicated primarily to agriculture; total agricultural land—as reported by the US Department of

Agriculture (USDA) Census of Agriculture—has averaged 33 million acres since 1920, with a range of 30.6 million acres in 2012 to 34.5 million acres in 1945 (Figure 8). Thus, over 90% of Iowa's total land area is dedicated to some facet of agriculture.

Response: The suggested addition to the text regarding Iowa land use has been incorporated into the 2019 NRS Annual Report.

Comments regarding the use of historical land use data

- The report focuses heavily on historic land use and changes over time, even going as far back as 1920. Since the INRS baseline only goes back to 1980-1996, we recommend that points of comparison such as those made for land use should only extend back to the same period utilized for the INRS baseline.
- Land use is also overemphasized with unnecessary data going back as far as 1920. The report again chooses one dataset over others, in this case the Cropland Data Layer which is known to have frequent errors regarding land use change especially near grass waterways and riparian buffers.
- It is most appropriate to compare historic land use changes to the 1980-1996 baseline period. Prior historic land use changes were influenced by other factors not relevant to the programs, inputs and results of the INRS and the WQI.
- [*Commenter*] appreciates the direct acknowledgement of the connection between land use and nutrient loss. This is a key factor that cannot be ignored.

Response: The historical land use change described on pages 16 to 18 are included to provide context regarding Iowa's overall land use patterns and to describe the effects of land use on nonpoint source nutrient loads.

Comment regarding data sources for tracking acres of cover crops

- The estimates for cover crops need additional explanation. The Report appears to rely on the fall 2016 estimate for cover crops, even though the Report is intended to address 2018-2019. It references but does not appear to rely on the more recent survey results from INREC. IEC has a number of questions related to the cover crop estimates:
    - Why does the Report use the fall 2016 number rather than a more recent estimate, as the previous annual report did?
    - Will future NRS annual reports only update this number every five years, after USDA releases survey results?
    - What is the methodology for the INREC survey?
    - What underlying data is reported for the INREC survey?
    - Will INREC treat the data as public data if it becomes part of the NRS?
    - Would INREC survey data be as reliable as the other methods of estimation?

Response: Past annual reports relied on federal and state cost-share databases to quantify annual cover crop acres. These data sources are detailed and reliable, and they do not capture cover crop acres that occur outside of public conservation programs. In early 2019, the results of the 2017 USDA Census of Agriculture became available, which indicates the acres of cover crops planted in fall 2016 (leading into the 2017 crop year). This data source was also used in this report to estimate 2017 acres of conservation tillage and no-till.

In 2019, the INREC Survey of Agricultural Retailers produced estimates for cover crops and tillage for the 2017 and 2018 crop years. The survey's methodology, which was developed in collaboration between INREC and the ISU Center for Survey Statistics and Methodology (CSSM), is presented in Appendix B. Raw data is stored and maintained by INREC; the aggregated results and statistical values reported directly to ISU for additional analysis by CSSM. Results from this survey are presented on pages 48 to 49. The INREC Survey provides important information on in-field management practices that occur within and beyond public conservation programs, and on a more frequent basis than the USDA Census of Agriculture can provide. Efforts to integrate the INREC Survey's findings into the NRS Annual Report's metrics are ongoing, and the questions that remain to be addressed are detailed on page 49.

Comment regarding data sources for tracking bioreactors and saturated buffers

- The graph documenting implementation of bioreactors has changed significantly from previous reports. The number of bioreactors constructed in the years 2011, 2012, and 2014 have changed with this report. Compared to previous reports, the draft 2018-19 report has an increase of three bioreactors constructed in 2011, a reduction of seven in 2012, and a reduction of two in 2014. Although the total number installed has not changed significantly, changed numbers for individual years make it appear as though the adoption rate of bioreactors is increasing over time. Please explain why the data has changed so dramatically, and if the adoption rate is in fact accelerating.

Response: The change in annual bioreactor construction from previous reports is due to a minor change in the data sources utilized for tracking this practice over time. For previous reports, bioreactors were tracked using state and federal cost-share, with some cross-referencing with Iowa Soybean Association's data on bioreactors that they assisted with. These three data sources presented challenges associated with duplication of reporting. For instance, the coarse resolution of the federal and ISA datasets made it difficult to discern whether the same bioreactor was reported twice. To address this concern, we worked with USDA-NRCS to obtain a dataset that provided additional information regarding the location, funding program, and cost of bioreactors installed, which minimized duplication and refined the annual tracking. This continual refinement of data sources and analysis is conducted for all NRS progress metrics. For more information on the data sources used for tracking each metric, see Appendix D.

Comment regarding descriptions of wetlands

- Page 30 Wetland. In the past there have been discussions about clearly differentiating "treatment wetlands" from the wetlands referred to in the report. Treatment wetlands generally refer to wetlands used to treat wastewater regulated under the Clean Water Act and are not allowed in perennial streams. They must be upland. Clearly, the wetlands described in the report fall outside this scope, but the terminology used may cause unwanted confusion – for example the first sentence on Page 30: *Wetlands that treat agricultural drainage for the reduction of nitrogen export have an effectiveness of 52 percent reduction and are primarily constructed through the Conservation Reserve Enhancement Program (CREP).* An example of alternative language might be: *Wetlands that capture agricultural drainage have an effectiveness of 52 percent nitrogen export reduction and are primarily constructed through the Conservation Reserve Enhancement Program (CREP).*

Response: The recommended alternative language has been incorporated into the 2019 NRS Annual Report for describing the effectiveness of CREP wetlands. For future NRS Annual Reports, there will be careful consideration of how to take these recommendations into account and revise the descriptions of all NRS edge-of-field practices (beyond just CREP wetlands).

Comments regarding the descriptions of point source facility permits and construction schedules
A set of comments brought attention to discrepancies and unclear descriptions in Tables 5, 6, and 7, and Figures 17 and 19.

Response: These tables, figures, and corresponding text were revised to correct errors and add clarification. Specific to figures 17 and 19, discrepancies were caused by the way permits that had been removed from the strategy, or amended to have the NRS requirements removed, were counted.

Comment regarding the modeled nonpoint source nutrient loads

- By reporting only on certain "selected" practices, the report introduces bias and confusion regarding the status of N and P reductions statewide since not all practices listed in the INRS are accounted for. We recommend that reporting on all INRS practices and their overall impact towards nutrient reduction goals be included in the report. To the extent that historical or current information on practice adoption levels are currently unavailable, the report should make it clear which practices those are and what information is needed. For any information that isn't currently available, we recommend that IDALS, ISU, and DNR prioritize efforts to obtain the needed information and incorporate it into future reporting.

Response: Efforts to incorporate additional practices into the modeled nonpoint source load estimates are continually ongoing. As indicated by tables 14 and 15, the load estimates represent "a partial picture of the nonpoint source practices and load reductions. These load change estimates reflect selected NRS practices for which there are long-term datasets available to track changes and calculate nitrogen load reductions. For other practices, emerging data are available, but are under evaluation for integrating into these modeled load calculations. University and public agency researchers are working to incorporate additional practices into this table by processing and evaluating emerging data sources. In addition, the load change affected by each practice does not factor in the effect of 'stacking' multiple practices within one field (e.g. a bioreactor plus cover crops in one location)."

Appendix D presents details of how each nonpoint source practice is tracked, which data sources are currently utilized or under review, and which practices are not tracked due to insufficient data availability.

Comment regarding point source reductions

- The point source reductions are unclear. The Report provides the reductions achieved for point source phosphorus loading (2,817 tons). This reduction is larger than the baseline phosphorus loading from point sources (2,386 tons). How can the reduction be larger than the baseline?

Response: The point source phosphorus reduction of 2,817 tons in Table 11 represents a reduction from what's being received at the treatment plants (influent) and what is being discharged to Iowa's waters (effluent). The baseline phosphorus loading of 2,386 represents what was estimated to be discharged to Iowa's waters during the baseline period. Figure 20 highlights the estimated nutrient loads to Iowa's

waters in 2017-18. Improvements to Table 11 will be provided in next annual report for additional clarity.

Comments regarding the INREC Survey of Agricultural Retailers

- [Commenter] is a strong supporter of the Iowa Nutrient Research & Education Council (INREC) and their successful efforts to partner with ISU to develop and carry out a statewide statistical survey of in-field practice adoption levels. While the report includes the 2017 and 2018 crop year survey results from INREC, it clearly did not utilize any of that information for the N and P load calculations, and instead relied on other data sources, including professional estimates and even cost-share datasets which are known to not fully represent total adoption levels for the "selected" practices that were included in the load calculations work. As compared to the information collected by the INREC randomized survey data, which is collected from irrefutable point-of-sale records that were paid for by the farmer and their associated field records, it is very concerning to [commenter] that the INREC statistically representative and random survey of these records was not utilized to report on the impact of practices - especially given the large amount of time and resources that have been spent by INREC and ISU to develop and carry out the survey.
- This being the 2019 annual report, it is curious why the Ag Census of 2017 and 2012 are utilized for cover crop reporting. The INREC survey reports cover crop acreage for 2017, 2018, and very soon for 2019. This seems like much more appropriate and frequent data for an annual report. Even if the frequency of NRS reporting becomes every two, three, four or five years, INREC survey data should be utilized as part of a rolling average. Using Census data every five years could greatly skew cover crop data in the event of weather, market, or other influences in that particular year.
- Data and methods relied upon in the Report must be publicly available. The Report suggests that data from the INREC survey could be used for future reporting, once the methodology to do so is developed. This approach could result in a lack of transparency because INREC is a private entity. The data used to develop the reporting on the NRS – which is the state's official policy – must be publicly available and transparent. Otherwise, there is a lack of accountability for the state entities charged with implementing the strategy.

Response: Page 49 describes that "representatives from ISU, IDALS, and DNR are developing a protocol for integrating [the INREC Survey findings] with existing information about in-field practices." This section explains the remaining questions that are being explored in efforts to integrate the survey's finding into progress tracking and nutrient load calculations.

One comment points out the report's statement that certain cover crops estimates (both from the INREC survey and from other data sources) are "currently under review by university and public agency researchers to assess whether and how they will be included in future versions of the NRS Annual Report". This statement has been revised to, "…to assess how they will be included…". The statement, "additional measures of cover crop acres are currently being reviewed and evaluated," has been adjusted to, "…being reviewed and assessed." These changes reflect the process through which university and agency researchers review incoming and emerging data sources and subsequently develop a procedure for integrating with existing data sources for tracking progress and calculating nutrient loads. It should be noted that some new data sources for cover crop acres (e.g. emerging remote sensing projects) are under review by university researchers to assess whether or not they will be incorporated, based on the efficacy of the methodologies associated with those emerging projects.

The findings of the INREC Survey are presented on pages 48 to 49. The USDA Census of Agriculture is an important and established information source, and the latest Census figures were newly available at the time that the 2019 NRS Annual Report was drafted. Complementary data sources, including the INREC Survey, provide important information on practice implementation on a more frequent basis that the USDA Census of Agriculture can provide. Efforts to integrate the INREC Survey's findings into the NRS Annual Report's metrics are ongoing, and the questions that remain to be addressed are detailed on page 49.

Regarding data availability and transparency, the principal author organizations continually work to further the transparency of NRS progress tracking methods. Methods and data sources are described in Appendix B, and this appendix and information will be continually refined. Some raw data must remain restricted from public access out of concern for respondent/participant privacy. These sources currently include public conservation databases, the NRS Farmer Survey, and the INREC Survey of Agricultural Retailers. In the case of the INREC Survey, the public-private partnership between INREC and ISU provisions the availability of aggregated data for transparency and public use.

Comments regarding the BMP Mapping Project

- It's unconscionable given the large amount of resources spent to achieve this first-in-the-nation mapping of all structural practices in the entire state that there has been no follow through by the INRS principal agencies to quantify the impact of these practices for reducing P losses. The report doesn't even provide a summary of the mapped practices totals statewide that could have at least provided some useful information regarding progress.
- While NRS implementation continues to grow, so does the vast amount of data across the logic model. We are concerned about the lack of consistency and clarity in the reporting of these data especially the glaring underutilization of the BMP mapping project and INREC survey. …The development of the BMP mapping project and INREC survey have negated the need to include cost share data for practice measurement. Cost share data is woefully incomplete and grossly underestimates practice adoption. Use of cost share data should be minimized if not eliminated.
- The mapping of structural practices needs further explanation. The proposed method of interpreting satellite imagery refers to digitization of "the 2010 benchmark existence of structural conservation practices." For the baseline and current practices, the approach is to digitize "using aerial photography." The Report also references use of LiDAR elevation data to identify practices, which we assume was not available for the period of 1980-1996. It is unclear whether the approach for the 2010 benchmark differs from the baseline and current practices, because the Report does not use identical descriptions of the procedures.

Response: The BMP Mapping Project provides counts, geometric areas, and geometric lengths of selected nonpoint source practices via aerial imagery and LiDAR. There is additional analysis ongoing for finalizing the quality assurance and quality control of the data, assessing progress from the NRS baseline period, and developing a process for estimating acres treated, sediment reduction, and P load reduction by those practices. The report has been revised to include a table of the preliminary statewide practice totals for the 2010 period. In addition, the report includes an appendix with practice totals by HUC8.

Cost-share databases are critical progress tracking tools for a numbers of reasons. First, these projects are complementary to cost-share data. Cost-share data provides context on the extent of public funding and resources allocated for nutrient reduction practices. Second, cost-share databases provide information for estimating the implementation of bioreactors, nitrate-removal wetlands, saturated buffers, and additional practices that are not tracked by the INREC Survey and the BMP Mapping project. Third, the BMP Mapping Project's findings do not capture certain time periods, as it has been

conducted for the 1980s, 2007-10, and 2016-17. Additional information on the data sources used for tracking various nonpoint source practices can be found in Appendix D.

For questions concerning the BMP Mapping Project's methodology, please see www.gis.iastate.edu/gisf/projects/conservation-practices for additional information on the ways that it integrates multiple sources of LiDAR and aerial imagery to map selected structural conservation practices. The link to the project's website has been added to the 2019 NRS Annual Report.

Comments regarding water monitoring metrics and the ambient water monitoring network

- There is a heavy focus on ambient stream monitoring metrics in the report (despite the numerous challenges with such monitoring that are also discussed in the report) while not fully carrying forward efforts to estimate practice impacts on nutrient loads utilizing the science of the INRS. We recommend priority be given to quantifying the impacts that measured practice adoption levels have had using the scientific assessment approaches detailed in the INRS.
- The report does a nice job of providing information on the N loads measured in-stream but fails to discuss the relationship between N load and flow which is evident in Figure 23. This figure clearly shows that the magnitude of N loads is heavily correlated with the amount of flow in any given year (more flow, more N), but there is no discussion of that to provide readers with that insight and understanding of what annual N loads derived from in-stream monitoring can tell us and what it cannot define regarding the impact that practices have had. Providing this information without discussion of how it should be properly interpreted is irresponsible, so the report needs to provide more discussion and insight regarding the relationship between flow and measured N loads.
- While there is much inconsistency and confusion in the Land category, resources continue to be poured into water monitoring while the report acknowledges the fact that the timeline for measurable progress is 20+ years. It may be time to reallocate these resources to fully utilize the BMP mapping project and INREC survey.
- [The] Report states that the data will be compared to baseline and benchmark data in future reports. There is no reason given for why the data cannot be compared now. In fact, it is the only way to track progress toward the state's nutrient reduction goal without any other metrics, benchmarks, or targets.
- Page 52, Figure 23 and Page 53, Table 12. Each of these indicate a flow in units of "cm" or centimeter which is not typically thought of as a flow. As IDNR explained, it is flow in the sense that it is x number of centimeters of rainfall projected to runoff in a year's time over the entire state. It would be good to include that explanation in the text. In addition, I am concerned the information provided in the graphs only gives a portion of the story, and to the casual observer they may read that the export is always on the increase – the graphs are always rising. I am not sure we can make that conclusion.

Response: The NRS Annual Report relies on a wide variety of metrics within the four dimensions of the Logic Model—Inputs, Human, Land, and Water. The ambient stream water monitoring is one of multiple metrics assessed for the Logic Model's Water dimension. Work is ongoing to refine existing procedures and establish new methods for tracking indicators within all four dimensions of the Logic Model.

The NRS Annual Report describes on pages 36 to 37 the annual statewide nitrogen load (based on stream water monitoring data) and its correlation with streamflow; it states that the "annual load estimates are displayed along with streamflow [in table 13], as streamflow amounts have the largest known impact on nutrient loading." To further emphasize this point, Figure 23 has been revised to better visualize the relationship between nitrogen load and flow.

Several options for comparing current progress to the baseline and benchmark time periods will be evaluated for future reports. It should be noted that table recommended by a commenter on page 31 of this document shows the baseline and benchmark loads reflecting modeled estimates of nitrogen loads based on nonpoint and point source practices during each time period; these estimates hold confounding factors (e.g. weather) constant to facilitate a direct comparison. The 2014-18 total average load presented in the suggested table is estimated from the water monitoring data presented in figure 23 in the report. These two separate approaches cannot and should not be compared directly.

Regarding the units used in Figure 23, the report has been revised to include additional clarification on the justification for using *centimeters* as a unit for streamflow.

Comment regarding numeric nutrient criteria

- Contrary to the Report, numeric nutrient criteria are not a priority for DNR. The Report states that developing "quantitative indicators of lake health" is a priority. The method for developing such indicators to set numeric nutrient criteria as prescribed by the Clean Water Act. IDNR released its triennial review of water quality standards in December, and numeric nutrient criteria were not included among its priorities.

Response: On page 43, the annual report highlights the efforts made relative to numeric nutrient criteria during the reporting cycle consistent with the commitment in the NRS for the continued assessment and development of suitable nutrient criteria as a long-term goal. Specific to Iowa lakes, it states the following: "Progress to date includes using national and Iowa data to estimate chlorophyll-a and microcystin relationships. Preliminary results have shown that combining state and national data can improve the performance of these new models. The documentation and review of the underlying science now is complete and the research behind this effort, titled 'Combining national and state data improves predictions of microcystin concentration,' was published in 2019. EPA is expecting to release the draft lake numeric nutrient criteria in early 2020 that incorporates this research in addition to other pending research publications."

Comment regarding in-stream bed and bank sediment

- The report recognizes the unique challenges for quantifying P loads with ambient water quality monitoring and discusses evaluation of the use of turbidity and ortho-phosphorus as surrogate measures to inform P load estimates. While it is appropriate to question the scientific merit of these potential surrogates, it should be noted that the INRS P loads targeted for reduction are field-to-stream transported P loads that cannot be accurately measured in-stream even if surrogate measures for P were found to have merit since the sediment and P loads generated from field-to-stream P transport cannot be segregated from the in-stream sediment and P loads derived from bed and bank erosion processes with in-stream monitoring that measures the combined P load from all sources. We recommend additional detail on these challenges be recognized and discussed in the report.

Response: The Iowa Nutrient Reduction Strategy's Executive Summary recognizes the research gap associated with in-channel bed and bank sediment and the resulting impacts phosphorus loads. As stated in that document, in-channel bed and bank sediment "should be recognized as an area of critical research" (page 10). University and agency researchers continue work to evaluate this complex facet of Iowa's phosphorus loads; researchers will collaborate to integrate findings and new understanding into the NRS Annual Report as they become available.

Comments regarding the role of watershed coordinators and the positioning of Watershed Management Authorities

- Watershed coordinators help advance each aspect of the logic model within the NRS and should be included as a priority recommendation for improvement within this draft progress report.
- We believe Watershed Management Authorities (WMAs) are best positioned to host watershed coordinators as they can identify methods and projects which strategically invest resources throughout a defined watershed, while also bringing together a variety of critical stakeholders.

Response: The principal author organizations for the NRS Annual Report have taken these comments into consideration for future activities and implementation related to nutrient reduction efforts. Part Three of the 2019 NRS Annual Report presents the staff resources dedicated by various partner organizations; these data will continue to be gathered for future annual reports. In addition, there will be careful consideration applied to how future annual reports describe the key role of watershed project coordinators in promoting nutrient reduction efforts across the state.

Comment regarding strategic work and building capacity

- The report also provides a great opportunity to outline the long-term vision for the INRS and its underlying WQI implementing program. It seems that IDALS, DNR and ISU could use a report to share highlights of how they plan to "ramp up" the WQI in the future.

Response: Part Two of the 2019 NRS Annual Report presents and details a substantial compilation of the strategic work and capacity-building that ISU, IDALS, DNR, and additional partner organizations are conducting to "ramp up" NRS-related efforts. A summary of this section will be included in an executive summary at the time of publication.

Comments Received During the Review Period are Presented Below

AGRIBUSINESS ASSOCIATION OF IOWA
GROWING IOWA'S FUTURE FOR 25 YEARS

AGRIBIZ.ORG
AAI@AGRIBIZ.ORG

March 11, 2020

Laurie Nowatzke
Measurement Coordinator, Iowa Nutrient Reduction Strategy
Iowa State University
College of Agriculture & Life Sciences
303F East Hall

Re: Request for Comments on INRS 2019 Annual Report Draft

On behalf of the Agribusiness Association of Iowa (AAI) we appreciate the opportunity to provide comments pertaining to the draft 2019 INRS Annual Report.

AAI's membership includes over 1,100 agribusinesses across the state that supply feed, seed, crop protection products, grain, fertilizer, equipment and agronomic products and services that benefit agriculture and the environment. Our members provide these products and services to virtually every farmer in Iowa. AAI is very active on behalf of our members in efforts to help implement and support Iowa's Nutrient Reduction Strategy and the voluntary, science-based framework it employs for achieving targeted reductions of nitrogen and phosphorus loads in our state's waterways from both point sources and non-point sources. As such, it is imperative that the collective efforts of our members and the farmers they assist on a daily basis are fully and accurately represented in the annual INRS reports in a manner that can accurately inform them and the citizens of Iowa of what progress has occurred by taking into account all of the best information available for all practices listed in the INRS science assessment.

This report dramatically strays from the goals and expectations of the INRS as originally adopted in 2013.
Our members are dedicated to helping farmers implement best management practices that reduce nitrogen and phosphorus losses to Iowa waters, so we ask that you strongly consider the following comments on the 2019 INRS Annual Report.

Comments:
1. As the official report of progress towards the 45% N and P load reduction goals of the INRS, it is concerning that the report is lacking an overall status report of progress towards INRS goals that compares current status to the 1980-1996 baseline as established by the Iowa legislature. This progress status is arguably the most important metric to report on as it represents the culmination of efforts to reduce N and P losses to Iowa waters, and without it the report falls short of informing us of the key progress metrics. We recommend that overall current progress towards the N & P load percentage reduction goals be provided by the report.

2. The report provides a large amount of information, yet no concise summary of the key progress metrics. It would benefit considerably from the addition of an executive summary that provides succinct yet informative details on the key metrics under the logic model to better inform readers of progress updates. To improve upon the readability and more effectively communicate the information contained in the report, we recommend additional consideration be given to how the information in this report can best be effectively conveyed to public audiences. Some suggestions would include relying less on lengthy text and instead focus more on conveying key information with more visuals and

summary points.

3. The report suggests measuring current status against the 2006-2010 benchmark period, yet the Iowa legislature has established that INRS progress is to be measured against the 1980-1996 baseline. We recommend keeping all comparisons consistent with reporting current status as compared to the 1980-1996 baseline for consistency purposes.

4. The report focuses heavily on historic land use and changes over time, even going as far back as 1920. Since the INRS baseline only goes back to 1980-1996, we recommend that points of comparison such as those made for land use should only extend back to the same period utilized for the INRS baseline.

5. By reporting only on certain "selected" practices, the report introduces bias and confusion regarding the status of N and P reductions statewide since not all practices listed in the INRS are accounted for. We recommend that reporting on all INRS practices and their overall impact towards nutrient reduction goals be included in the report. To the extent that historical or current information on practice adoption levels are currently unavailable, the report should make it clear which practices those are and what information is needed. For any information that isn't currently available, we recommend that IDALS, ISU, and DNR prioritize efforts to obtain the needed information and incorporate it into future reporting.

6. AAI is a strong supporter of the Iowa Nutrient Research & Education Council (INREC) and their successful efforts to partner with ISU to develop and carry out a statewide statistical survey of in-field practice adoption levels. While the report includes the 2017 and 2018 crop year survey results from INREC, it clearly did not utilize any of that information for the N and P load calculations, and instead relied on other data sources, including professional estimates and even cost-share datasets which are known to not fully represent total adoption levels for the "selected" practices that were included in the load calculations work. As compared to the information collected by the INREC randomized survey data, which is collected from irrefutable point-of-sale records that were paid for by the farmer and their associated field records, it is very concerning to AAI that the INREC statistically representative and random survey of these records was not utilized to report on the impact of practices - especially given the large amount of time and resources that have been spent by INREC and ISU to develop and carry out the survey.

While the report suggests that the INREC data is undergoing evaluation for how to incorporate it in future reports, in the last paragraph on page 27 it goes so far as to question "whether" the INREC survey data will be utilized. This is a very concerning statement, especially given that ISU in their final report to the legislature on the INREC survey pilot project recommended that "the system developed be adopted as the official method for measuring, documenting and quantifying progress under the Iowa Nutrient Reduction Strategy." Furthermore, the same paragraph on page 27 suggests that the methodology associated with the INREC survey is undergoing evaluation, yet the statistical sampling protocols and methodology were developed fully in coordination with ISU and the ISU Center for Survey Statistics and Methodology (CSSM) as detailed in the report appendices, so we are confused as to what methodology evaluation has yet to take place.

Given that the accountability and verification measures listed in the INRS call for establishment of a public/private reporting system capable of tracking nutrient management and conservation practices across the state, and that INREC and ISU have successfully developed that system, it is imperative that we utilize that information to better inform us on the impact that measured levels of practice adoption have had.

7. AAI is also supportive of the ag BMP GIS mapping project that INREC provided considerable support for, and recommends that IDALS, ISU, and DNR prioritize efforts to analyze the information this project has provided and utilize it to quantify the impact that the various conservation practices it measured have had towards the P reduction goals measured back to the 1980-1996 baseline. It's unconscionable given the large amount of resources spent to achieve this first-in-the-nation mapping of all structural practices in the entire state that there has been no follow through by the INRS principal agencies to quantify the impact of these practices for reducing P losses. The report doesn't even provide a summary of the mapped practices totals statewide that could have at least provided some useful information regarding progress.

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8. There is a heavy focus on ambient stream monitoring metrics in the report (despite the numerous challenges with such monitoring that are also discussed in the report) while not fully carrying forward efforts to estimate practice impacts on nutrient loads utilizing the science of the INRS. We recommend priority be given to quantifying the impacts that measured practice adoption levels have had using the scientific assessment approaches detailed in the INRS.

9. The report recognizes the unique challenges for quantifying P loads with ambient water quality monitoring and discusses evaluation of the use of turbidity and ortho-phosphorus as surrogate measures to inform P load estimates. While it is appropriate to question the scientific merit of these potential surrogates, it should be noted that the INRS P loads targeted for reduction are field-to-stream transported P loads that cannot be accurately measured in-stream even if surrogate measures for P were found to have merit since the sediment and P loads generated from field-to-stream P transport cannot be segregated from the in-stream sediment and P loads derived from bed and bank erosion processes with in-stream monitoring that measures the combined P load from all sources. We recommend additional detail on these challenges be recognized and discussed in the report.

10. The report does a nice job of providing information on the N loads measured in-stream but fails to discuss the relationship between N load and flow which is evident in Figure 23. This figure clearly shows that the magnitude of N loads is heavily correlated with the amount of flow in any given year (more flow, more N), but there is no discussion of that to provide readers with that insight and understanding of what annual N loads derived from in-stream monitoring can tell us and what it cannot define regarding the impact that practices have had. Providing this information without discussion of how it should be properly interpreted is irresponsible, so the report needs to provide more discussion and insight regarding the relationship between flow and measured N loads.

11. Regarding the frequency of future INRS progress reports, AAI is supportive of a biennial report or other such appropriate reporting interval as opposed to annual comprehensive progress reports to allow more time for report preparation and since year-to-year changes in practice adoption levels will likely occur in small increments and be heavily affected by weather from one year to the next. Going to a less frequent report interval, while continuing annual measurement efforts, could provide a nice balance to provide more useful information on progress reporting efforts in the future.

Thank you for providing the opportunity to comment on this important report.

Sincerely,

Joel Brinkmeyer, CEO
Agribusiness Association of Iowa
900 Des Moines Street
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515-262-8323

CENTER for RURAL AFFAIRS
VALUES | WORTH | ACTION

March 11, 2020
Attn: 2018-2019 Iowa Nutrient Reduction Strategy Draft Report
Re: Center for Rural Affairs Comments on Draft Iowa Nutrient Reduction Strategy Report.

Iowa Nutrient Reduction Strategy Partners,

The Center for Rural Affairs believes any successful approach to reducing nutrient pollution in Iowa's water bodies must include a strong emphasis on robust local action, human infrastructure, and long-term planning at the watershed scale. We are appreciative of the opportunity to submit comments on this draft of the annual report and encourage you to consider our input prior to the publication of the final document. Incorporating stakeholder feedback on an annual basis is a crucial part of steering nutrient reduction and water quality progress in the state.

The framework of the Iowa Nutrient Reduction Strategy (NRS) includes a focus on the logic model approach; a key component of which is inputs, namely, funding. Our organization and constituents believe the state of Iowa should invest in the necessary human infrastructure to achieve the desired outcomes of the NRS, specifically in regard to long-term watershed staffing. In recommendations to the Iowa General Assembly, the Water Resources Coordinating Council[1] and the Watershed Planning Advisory Council[2] have both agreed—the state should invest more in watershed coordinators, including sustainable funding, benefits packages, and other resources.

On page 8 of Part Two of the NRS draft report, the Iowa Department of Agriculture and Land Stewardship (IDALS) highlights the number of agency staff acting to advance the goals of the NRS at 200.7 for infrastructure and on-the-ground implementation. According to IDALS internal numbers, the Department currently employs 366.6 out of 372[3] of its full time employee (FTE) cap set by the Legislature. Meanwhile, the Iowa Department of Natural Resources is 97[4] FTEs short of their cap and, according to page 11 of Part Two, has 22.7 staff working to advance the goals of the NRS.

Given that 95 percent of the $560 million of public and private investment dedicated to NRS efforts are from public sources, we believe it is imperative to raise the issue of FTE caps at state

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[1] Recommendations And Funding Options Approved By The Water Resources Coordinating Council. Nov. 2009, https://www.iowaagriculture.gov/wrcc/wrcc_recommendations.pdf
[2] Watershed Planning Advisory Council 2019 Annual Report. Dec. 2019, www.iowaagriculture.gov/WPAC/pdf/2019/WPAC%202019%20Annual%20Report.pdf.
[3] Personal Communication, Maison Bleam, Legislative Liaison, Iowa Department of Agriculture and Land Stewardship. Feb. 2020.
[4] Personal Communication, Adam Schieders, Water Quality Resource Coordinator, Iowa Department of Natural Resources. March 2020.

agencies and illustrate the need for more investment in human infrastructure. Notably, despite nearly $20 million in non-base program NRS-focused public funding, which offer more flexibility, investments in long-term staffing of watershed coordinators has not yet been a large target of those funds.

Watershed coordinators help advance each aspect of the logic model within the NRS and should be included as a priority recommendation for improvement within this draft progress report. Assisting with outreach events, facilitating long-term watershed planning, and building lasting relationships with landowners in a watershed are key job functions of a watershed coordinator and are also crucial for achieving the voluntary goals of the NRS. As a result of new funding sources, whether it be the eventual adoption of the Natural Resources and Outdoor Recreation Trust Fund or the projected increases in Senate File 512 funding laid out in this draft report, more investments need to be made to employ watershed coordinators with full benefits packages to reduce turnover and the prevent the resetting of long-term progress at the watershed scale.

We believe Watershed Management Authorities (WMAs)[5] are best positioned to host watershed coordinators as they can identify methods and projects which strategically invest resources throughout a defined watershed, while also bringing together a variety of critical stakeholders. With strategic increases in sustainable state support, a defined member of a WMA could serve as a host for watershed coordinators, empowering communities to look holistically at the watershed, create a watershed management plan that includes nutrient reduction goals, and make progress in developing relationships with farmers, landowners, and point source polluters to help implement nutrient reduction practices. Importantly, coordinators can also work to couple nutrient reduction benefits with flood risk reductions, helping create more resilient communities in Iowa.

Improving Iowa's water quality hinges on robust action at the local level. We believe local stakeholders including farmers, landowners, and local officials—with the help of technical professionals—are best positioned to identify the water quality and flood management practices that fit best their needs. WMAs play a crucial, often undervalued role, of bringing together cities, counties, and soil and water conservation districts, which represent a variety of stakeholders while providing the best return on investment for taxpayer dollars. Notably, WMAs do not create another layer of government, but rather use the existing authority of their members to make strategic investments in a watershed while being accountable to the voters in their communities.

To achieve accelerated and long-term success toward the goals of the Iowa NRS, investments that employ watershed coordinators in WMAs across the state offer a pragmatic and proven path forward. The Center believes that with sustainable funding dedicated to this crucial human

[5] https://www.cfra.org/sites/default/files/publications/WatershedMgmtAuthorities.pdf

infrastructure, Iowa could greatly accelerate the voluntary adoption of conservation practices on the landscape and make meaningful progress toward the goals of the NRS.

Cody Smith
Policy Associate

March 11, 2020

Iowa State University
College of Agriculture & Life Sciences
303F East Hall
Ames, IA 50011

Dear Laurie Nowatzke:

On behalf of Iowa Corn, I would like to provide the following written comments regarding the Iowa Nutrient Reduction Strategy (NRS) annual report. Iowa Corn is a joint organization of the Iowa Corn Growers Association (ICGA) and Iowa Corn Promotion Board, representing over 7,500 ICGA dues-paying members and all corn checkoff contributors in Iowa. Our Animal Agriculture and the Environment committee is responsible for addressing livestock and environmental issues including water quality and nutrient loss reduction.

We appreciate the time and effort required to develop a comprehensive reporting of activities supporting implementation of the NRS especially across all categories of the logic model. Iowa Corn has invested millions of dollars in water quality efforts since NRS implementation started. We want to ensure that this support is accounted for, as well as the support and activities by all Iowans especially farmers and landowners.

While NRS implementation continues to grow, so does the vast amount of data across the logic model. We are concerned about the lack of consistency and clarity in the reporting of these data especially the glaring underutilization of the BMP mapping project and INREC survey. The State of Iowa and many partners have invested millions of dollars in these novel, statistically robust data collection efforts. Many states across the country are very interested in how to replicate these efforts for their state strategies. If these two projects have issues, then they need to be corrected so that these investments are not wasted, and all practices identified in the science assessment can be accounted for. Iowa Corn will continue to offer support if needed.

The development of the BMP mapping project and INREC survey have negated the need to include cost share data for practice measurement. Cost share data is woefully incomplete and grossly underestimates practice adoption. Use of cost share data should be minimized if not eliminated.

This being the 2019 annual report, it is curious why the Ag Census of 2017 and 2012 are utilized for cover crop reporting. The INREC survey reports cover crop acreage for 2017, 2018, and very soon for 2019. This seems like much more appropriate and frequent data for an annual report. Even if the frequency of NRS reporting becomes every two, three, four or five years, INREC survey data should be utilized as part of a rolling average. Using Census data every five years could greatly skew cover crop data in the event of weather, market, or other influences in that particular year.

The report overemphasizes the benchmark period of 2006-2010. The baseline for progress measurement is 1980-1996. The Hypoxia Task Force uses this baseline, but more importantly, Senate File 512 requires this.

Land use is also overemphasized with unnecessary data going back as far as 1920. The report again chooses one dataset over others, in this case the Cropland Data Layer which is known to have frequent errors regarding land use change especially near grass waterways and riparian buffers.

While there is much inconsistency and confusion in the Land category, resources continue to be poured into water monitoring while the report acknowledges the fact that the timeline for measurable progress is 20+ years. It may be time to reallocate these resources to fully utilize the BMP mapping project and INREC survey.

We appreciate all the effort that went into this year's report and look forward to continued improvements in the future so that all Iowans' activities can be accounted for. If practical information and trends cannot be reported on an annual basis, then reporting should become less frequent to reduce time and effort. Iowa Corn will continue our own water quality programs and will consider any requests for support from ISU, IDALS, and DNR.

Sincerely,

Ralph Lents

Ralph Lents, chairman
Animal Agriculture and the Environment committee

Iowa Environmental Council

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515-244-1194 Phone
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March 11, 2020 **VIA EMAIL**

Laurie Nowatzke
Measurement Coordinator, Iowa Nutrient Reduction Strategy
Iowa State University
College of Agriculture & Life Sciences
303F East Hall
Ames, IA 50011
lwissler@iastate.edu

RE: Comments on Draft Iowa Nutrient Reduction Strategy: 2018-19 Annual Progress Report

Dear Ms. Nowatzke:

The Iowa Environmental Council ("Council") offers the following comments on the draft 2018-19 Annual Progress Report ("Report") of the Iowa Nutrient Reduction Strategy ("NRS"). These comments represent the views of the Iowa Environmental Council, an alliance of over 75 organizations, at-large board members from business, farming, the sciences and education, and over 500 individual members.

GENERAL COMMENTS

The Council makes the following general comments about the Report:

- **The breadth of reporting on the Iowa Nutrient Reduction Strategy is impressive and deserves commendation.** Iowa sets the standard for consistently producing an annual report on a state NRS. Publicly available data is vital for stakeholders to understand the state's progress toward nutrient reduction, and robust annual reporting should continue to be a priority for the state.

- **Continued reliance on funding as a metric for voluntary efforts is misplaced and will not achieve the state's goals.**
  The Report highlights the government and private funding for "NRS-related" efforts, but fails to address critical issues that demonstrate the inadequacy of the voluntary approach to conservation practice implementation. Increases in financial incentives have failed to result in an equivalent increase of practice implementation. There has been advocacy for voluntary change for decades, but the state is not achieving its water quality goals. Furthermore, the funding for conservation practices does not look at the flipside of the coin – the funding for subsidies and crop insurance that incentivize production over conservation.

- **The "Human" component demonstrates the inadequacy of the existing voluntary approach for nonpoint sources.**
  The Report found "there was relatively little change in attitudes" statewide and "no change" in significant watersheds. The state is not on a reasonable pace to meet the goals of the Nutrient Reduction Strategy, and the lack of change in attitudes demonstrates that it will not increase the pace of progress. Even in the Iowa River watershed, although knowledge about the NRS increased among farmers, there was minimal change in farmer attitudes toward the NRS.[1]

  Additionally, since the adoption of the NRS in 2013 and increase outreach events related to the NRS, we have not seen an increase in adoption rates of conservation practices.[2] This challenges the assumption that education will lead to attitude change and therefore behavior change. It is very difficult to change attitudes merely through education, let alone behavior – which is also influenced by factors such as economics and the hassle of doing something versus doing nothing.[3] Tracking outreach efforts should continue, but the outreach must be proven to actually change behavior and, ultimately, improve water quality. The ample outreach efforts to date have led to little or no change in attitude or behavior. As a result, implementation of the strategy should be adjusted to require basic standards of care for nonpoint sources.

- **Demonstrated progress toward the nutrient reduction goal remains inadequate.**
  The NRS has a stated goal to reduce nutrient export by 45%. Although this report now contains nitrate export data, which is commendable, the report still does not compare such data to the baseline or benchmark data to demonstrate how much progress has been made toward that goal. This comparison can be easily made – see comments below under Water Component.

  Further, the report has left out all references to the NRS science assessment scenarios that would provide an alternate way to track progress. Despite the state's reluctance to use the scenarios to measure progress, in lieu of any other data, benchmarks, or targets, they are one of the only ways to assess progress on the NRS. Scenarios should therefore remain part of the reporting until the state develops and includes targets and benchmarks for progress reporting.

DETAILED COMMENTS ON SPECIFIC ISSUES

IEC completed detailed reviews of the information in the Report. Based on our review, we have several specific comments and questions.

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[1] Report at 17.

[2] "Progress Toward Nutrient Reduction Strategy Goals," Iowa Environmental Council, available at https://www.iaenvironment.org/webres/File/NRS%20Implementation%20FINAL%207_16_19.pdf.

[3] Heberlein, Thomas A. *Navigating Environmental Attitudes.* New York: Oxford University Press, 2012.

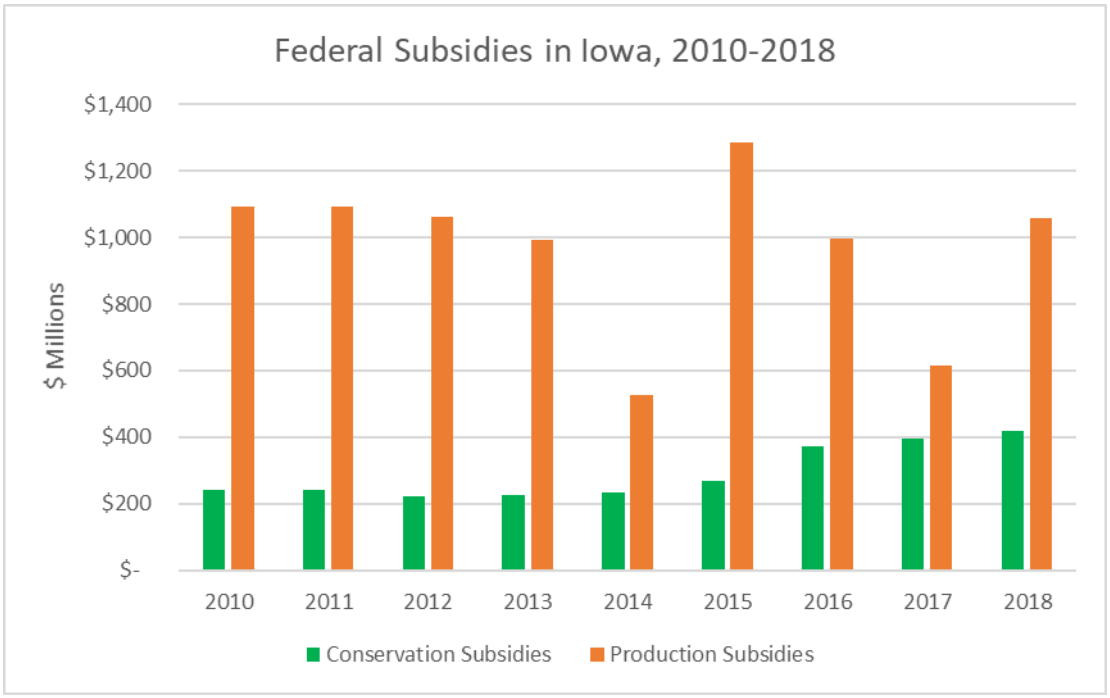
Our observations and comments on these assessments are as follows:

Part 1: Measured Progress

Funding

- **Reporting on funding for NRS-focused programs should be in a separate graph from federal programs.** Although the NRS estimated potential costs to achieve its stated goals, that estimate was premised on specifically targeting resources to implement practices that reduce nutrients – particularly new resources and new programs. The largest portion of the "NRS-related" funding is through the federal Conservation Reserve Program (CRP), a program that was already well-established before the NRS was adopted. CRP has multiple aims, not just nutrient reduction, and relies on voluntary sign-ups.[4] A direct comparison of federal and NRS-focused funding is misleading due to the different goals of the programs and the scale and administration of funding.

- **Reporting on funding should be put into context.** Considering only conservation funding ignores production incentives that can more than offset the funding.



[4] "Conservation Reserve Program," USDA, available at https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/index (identifying water quality, soil erosion and wildlife habitat).

Figure 1: Comparison of federal Farm Bill funding for conservation programs and funding for programs that incentivize production in Iowa, including crop insurance, commodity subsidies, and disaster relief programs. *Data: Environmental Working Group Farm Subsidy Database via USDA.*

- **Funding assessments fail to address the temporary nature of certain management practices.** CRP contracts last 10 or 15 years,[5] after which the land may be re-enrolled or may return to row crops. Looking at CRP funding without accounting for the net change in CRP funding ignores this fact. In 2018, Iowa had 158,395 acres of expiring CRP.[6] Cumulatively, the state will have over 1 million acres expiring between 2020 and 2030. Annual expiration amounts vary significantly[7] and should be included in the annual report when considering the funding for CRP. This also reflects the variability in CRP funding, over which the state of Iowa has no control.

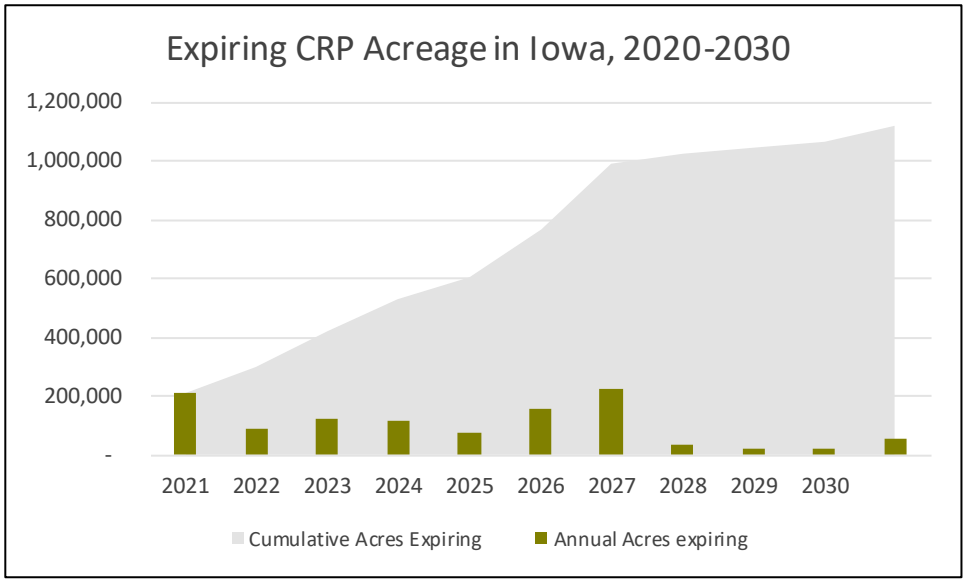


Figure 2: CRP contract acres set to expire 2020-2030. *Data: USDA*

Human Component

The lack of changes in knowledge and attitudes is disappointing and should result in changes to implementation strategies. The fact that a quarter of farmers surveyed claim not to be very familiar with the NRS and there was minimal to no change in attitudes toward the NRS (with no articulation of what these baseline attitudes are) suggests that education efforts are not adequate to result in behavior change and broad implementation

[5] "Conservation Reserve Program," USDA, available at https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/index.
[6] "CRP Contract Expirations by State," USDA, available at https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/Conservation/Excel/stateexpired1630.xls.
[7] For example, 2017 had more than double the expiring acres of 2016. *Id.*

of conservation practices.

We recommend the Report answer the following questions:

- How does the state plan to address the fact that "there was relatively little change in attitudes" statewide (15), and "no change" in important watersheds (17)?
- How have outreach efforts affected on-the-ground conservation practice adoption?
- Do data show that farmer awareness of the NRS is correlated to or has resulted in conservation practice adoption?
- What actions will the state take to improve knowledge and behavior of people whose participation is necessary to achieve the goals?
- Are there plans to conduct future attitude surveys that look at longer-term attitudinal shifts and practice adoption?

At what point does lack of attitudinal shift result in change of NRS implementation strategy to reach the 45% reduction goal within a reasonable timeframe?

Land Component

- **The state has completely, and without explanation, removed reference to scenarios from the NRS science assessment.** Without benchmarks and targets for the NRS, there is no other way to assess progress toward nutrient export reduction. The scenarios show how the state can actually achieve nutrient export reduction, so they should continue to be reported on, even if the outcomes are unsatisfactory. Alternatively, the state could report on nutrient export data to track progress – see comments under Water Component.

- **IEC appreciates the direct acknowledgement of the connection between land use and nutrient loss.** This is a key factor that cannot be ignored. It is striking to see that land use has moved in the opposite direction of what would result in nutrient export reduction, as described on page 23. How does the state plan to address changes in land use that increase the likelihood of nutrient loss?

- **The estimates for cover crops need additional explanation.** The Report appears to rely on the fall 2016 estimate for cover crops, even though the Report is intended to address 2018-2019. It references but does not appear to rely on the more recent survey results from INREC. IEC has a number of questions related to the cover crop estimates:
    - Why does the Report use the fall 2016 number rather than a more recent estimate, as the previous annual report did?
    - Will future NRS annual reports only update this number every five years, after USDA releases survey results?
    - What is the methodology for the INREC survey?
    - What underlying data is reported for the INREC survey?
    - Will INREC treat the data as public data if it becomes part of the NRS?

- Would INREC survey data be as reliable as the other methods of estimation?

- **We look forward to seeing the results of the commercial nitrogen fertilizer and manure study mentioned on page 28 in the next NRS progress report.** We hope to see a direct comparison of commercial fertilizer and manure application rates under the NRS to the application rates from the baseline and benchmark periods.

- **The graph documenting implementation of bioreactors has changed significantly from previous reports.** The number of bioreactors constructed in the years 2011, 2012, and 2014 have changed with this report. Compared to previous reports, the draft 2018-19 report has an increase of three bioreactors constructed in 2011, a reduction of seven in 2012, and a reduction of two in 2014. Although the total number installed has not changed significantly, changed numbers for individual years make it appear as though the adoption rate of bioreactors is increasing over time.

  Please explain why the data has changed so dramatically, and if the adoption rate is in fact accelerating. See the figures below for comparison to previous reports.

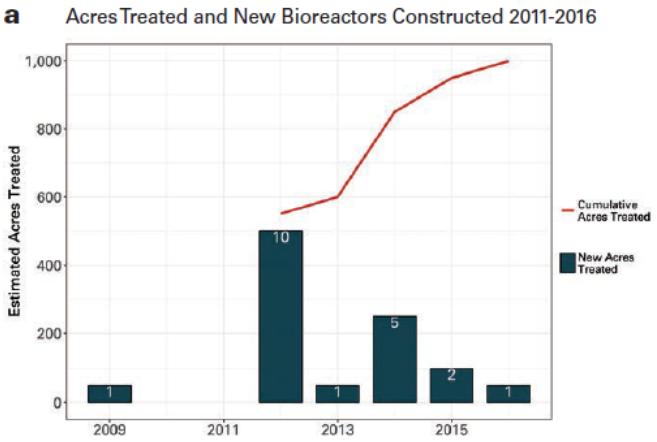


Figure 17. Acres treated by government-funded edge-of-field practices and cumulatively since 2011. The text inside the bars indicates the a,b) number of practices constructed each year, and c) the annual new acres treated.

a. Bioreactors

b. Wetlands constructed through the Conservation Reserve Enhancement Program (CREP)

c. Terraces, water and sediment control basins (WASCOBs) and grade stabilization structures

Figure 3: Graph of bioreactor construction from 2016-17 NRS Progress Report, page 35.

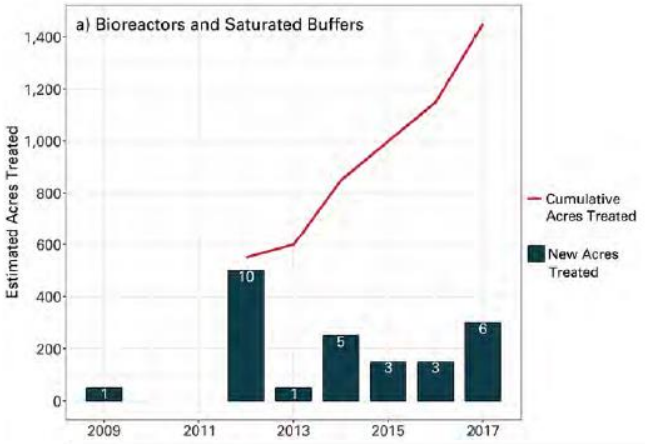


Figure 22. Acres treated by government-funded edge-of-field practices and cumulatively since 2011. The text inside the bars indicates the a,b) number of practices constructed each year, and c) the annual new acres treated.

[a] Bioreactors and saturated buffers

[b] Wetlands constructed through Conservation Reserve Enhancement Program (CREP)

[c] Terraces, water and sediment control basins (WASCOBs) and grade stabilization structures

Figure 4: Graph of bioreactor construction from 2017-18 NRS Progress Report, page 39.

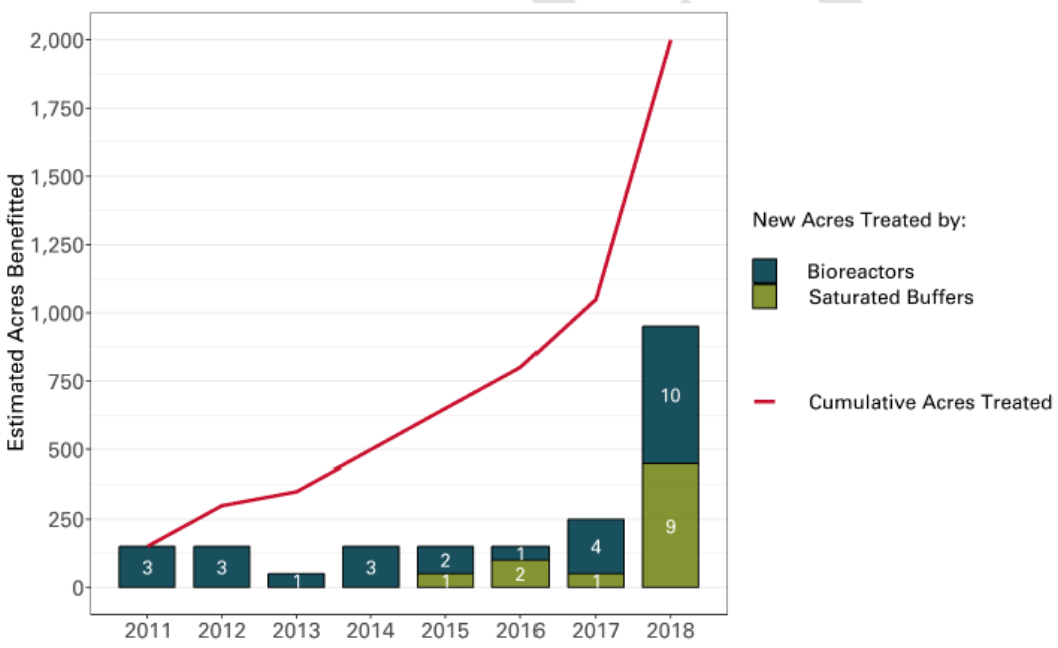


Figure 14. Annual installation of bioreactors and saturated buffers. The bars represent the estimated acres benefitted by each practice (at 50 acres per practice), and the inset numbers indicate the number of practices installed each year. The red line tracks the cumulative acres treated by all bioreactors and saturated buffers since 2011.

Figure 5: Graph of bioreactor construction from 2018-19 draft NRS Progress Report, page 29.

- **The point source reductions are unclear.** The Report provides the reductions achieved for point source phosphorus loading (2,817 tons).[8] This reduction is larger than the baseline phosphorus loading from point sources (2,386 tons). How can the reduction be larger than the baseline?

Water Component

[8] Report at 44.

IEC applauds the state's inclusion of nitrate export data in this report. We have been asking for this data for years and are happy to see it included in the Report.

However, the Report states that the data will be compared to baseline and benchmark data in future reports.[9] There is no reason given for why the data cannot be compared now. In fact, it is the only way to track progress toward the state's nutrient reduction goal without any other metrics, benchmarks, or targets.

We recommend this table be added to the report for easy comparison to baseline and benchmark data, matching the format of the table on page 8.

		1980-96 baseline load (tons)	**2006-10 benchmark load (tons)**	**2014-2018 5-yr average load (tons)**	**% change from baseline**
Nitrogen	NPS	278,852	293,395	372,619	33.6% increase
	PS	13,170	14,054	17,650	34% increase
	Total	292,022	307,449	392,230	34.3% increase

The nonpoint source (NPS) and point source (PS) loads were calculated as 95% and 5% of the total load respectively, consistent with the data from baseline and benchmark periods.[10]

Part Two: Strategic work and capacity

- **Contrary to the Report, numeric nutrient criteria are not a priority for DNR.** The Report states that developing "quantitative indicators of lake health" is a priority.[11] The method for developing such indicators to set numeric nutrient criteria as prescribed by the Clean Water Act. IDNR released its triennial review of water quality standards in December, and numeric nutrient criteria were not included among its priorities. The fact that other states and EPA are working on developing standards or recommended criteria does not make them a priority in Iowa – states and EPA have worked on the issue for decades, and Iowa still does not have numeric nutrient criteria for any waterbody. In fact, IEC filed a petition with the Environmental Protection Commission two years ago requesting that the state establish numeric nutrient criteria. That petition was denied, largely under

[9] Report at 55.
[10] Report at 8.
[11] Report at 63.

the justification that the NRS is sufficient alone to address nutrient pollution. The NRS draft report appears to acknowledge that setting numeric nutrient criteria is an important tool for reducing nutrient pollution.

- **Data and methods relied upon in the Report must be publicly available.** The Report suggests that data from the INREC survey could be used for future reporting, once the methodology to do so is developed.[12] This approach could result in a lack of transparency because INREC is a private entity. The data used to develop the reporting on the NRS – which is the state's official policy[13] – must be publicly available and transparent. Otherwise, there is a lack of accountability for the state entities charged with implementing the strategy.

  INREC's cover crop estimate for 2017 appears to be inconsistent with the USDA data: the acreage estimated by INREC is more than 60 percent higher for the same year.[14] This is more than double the standard error listed for the INREC data.[15]

  In addition, the commercial fertilizer sales results are alarming at best. Average rates of more than 170 lbs/acre indicate the potential for significant overapplication of nitrogen given the proportion of fields that do not have corn following corn. These data provide clear evidence that the "human" component of the NRS is failing. Moreover, the reported application rate is, in fact, increasing.

- **The mapping of structural practices needs further explanation.** The proposed method of interpreting satellite imagery refers to digitization of "the 2010 benchmark existence of structural conservation practices."[16] For the baseline and current practices, the approach is to digitize "using aerial photography."[17] The Report also references use of LiDAR elevation data to identify practices,[18] which we assume was not available for the period of 1980-1996. It is unclear whether the approach for the 2010 benchmark differs from the baseline and current practices, because the Report does not use identical descriptions of the procedures. IEC recommends that this be clarified in the final Report.

CONCLUSION

We look forward to seeing the final version of the Report in the coming weeks. Thank you for the opportunity to comment on the draft Report. If you have questions or I can clarify these comments further, please feel free to call me.

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[12] Report at 27-28, 73.
[13] IOWA CODE § 455B.177.
[14] Cf. Report at 71 ("The INREC survey estimated 1,598,000 acres of cover crops were planted fall 2016") and 27 ("USDA estimated that 973,000 acres were planted in fall 2016").
[15] Report at 71.
[16] Report at 73.
[17] *Id.* at 74.
[18] *Id.* at 73.

Sincerely,

/s/ Ingrid Gronstal Anderson

Ingrid Gronstal Anderson
Water Program Director
Iowa Environmental Council

Cc: Adam Schnieders, Iowa Department of Natural Resources
Jake Hansen, Iowa Department of Agriculture and Land Stewardship
Matt Lechtenberg, Iowa Department of Agriculture and Land Stewardship
Dr. Matt Helmers, Iowa State University

March 9, 2020

Laurie Nowatzke
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RE: Comments on the Draft INRS Progress Report

The Iowa Farm Bureau Federation (IFBF), the largest general farm organization in the state with more than 153,000 members, appreciates the opportunity to comment on the Iowa Nutrient Reduction Strategy Draft Progress Report. Iowa farmers are successfully taking on the challenge of adding new soil and water quality practices and structures. In this report, Iowa officials have a great opportunity to report on progress towards the Measurable Indicators of Desirable Change (the Logic Model). Indictors of progress should be clearly noted in a short summary at the very beginning of each report in a way that Iowans, policymakers and the media can quickly see and understand that progress has been achieved.

Some of the important facts that must be included in a consistent summary format include:

- *Inputs* (people; funding; agency & private sector resources);
    - *$560 million in public and private funds were dedicated to INRS-related efforts in the 2019 reporting period, a 9 percent increase from the previous year. Private funding was more than $3.3 million while public funding was more than $20 million.*
    - *Last year, the Legislature continued its commitment for Iowa's water quality initiative and its traditional water quality and soil conservation programs. This includes $10.575 million in annual funding for the state's Water Quality Initiative, $7.835 million for the soil conservation cost-share program, and $1.875 million for the ag drainage well closure program. These funds were in addition to the increased funding from Senate File 512 (the long-term, $270 million in sustainable funding for the Iowa Nutrient Reduction Strategy that was approved during the 2018 session).*
    - *At least 84 WQI demonstration and implementation projects. This includes nine planning and development projects, 13 targeted watershed projects, 7 projects*

focused on expanding the use and innovative delivery of water quality practices and 55 urban water quality demonstration projects. More than 320 organizations are participating in these projects. The state awarded these 84 projects over $29.5 million in funding. Private partners and landowners invested more than $49 million to support these project efforts.

- *Human* (partner organizations; agribusinesses; farmer knowledge and attitudes; point sources and management knowledge, attitudes);
    - *540 outreach events were hosted by partner organizations, with a total attendance of 50,800 attendees in 2019. Total events increased from 511 in 2018, and total attendance increased from 46,000.*
- *Land* (land use changes; practice adoption; point source implementation);
    - *Statewide estimates (beyond just cost-share) indicate 2,015,688 acres of cover crops were planted in 2018, an increase of 26 percent from the previous year, according to results from the Iowa Nutrient Research & Education Council (INREC) annual progress measurement system using retailer and Certified Crop Advisor farm records to track and demonstrate environmental progress being made by Iowa farmers.*
    - *The annual INREC survey also indicated continued shifts from fall anhydrous fertilizer last year to more spring and in-season fertilizer applications. When fall applications were made, more farmers are using a nitrification inhibitor, the survey shows.*
    - *The value of the long-term investment by farmers and the public is estimated at $6.2 billion, according to a 2018 statewide LiDAR mapping of just six types of conservation practices (terraces, ponds, grassed waterways, water and sediment control basins, contour strip cropping and contour buffer strips/prairie strips). The initial number of practices identified by the mapping project include:*
        - *114,400 pond dams*
        - *327,900 acres of grassed waterways*
        - *506,100 terraces stretching 88,874 miles*
        - *246,100 water and sediment control basins stretching 12,555 miles*
        - *557,700 acres of contour buffer strips*
        - *109,800 acres of strip cropping*
    - *Of the 152 municipal wastewater plants and industrial facilities required to assess their nutrient removal capacity as part of the INRS, 133 have been issued new permits. Of those, 94 have also submitted feasibility studies on potential technology improvements.*
- *Water* indicators (calculated load reduction, measured loads in priority watersheds, measure loads at existing monitoring stations).

- *Despite 88 percent of Iowa's surface water quality being measured by various sensors installed and maintained by state or federal agencies, many challenges exist in understanding what those results show relative to modeled water quality status. Models remove variability caused by weather. Traditional water monitoring with sensors occurs at various scales, from edge-of-field to large watersheds. Limiting factors to traditional surface water monitoring include lag times to see results at larger watershed scales, legacy nutrients in stream banks and beds, and variable stream flow due to weather. Expected water quality improvements are also modeled using known practice performance and the number of practices on the landscape. Modeling that removes the variance caused by weather has already documented, for example, a 22 percent decrease in phosphorus loading from the agricultural landscape since the 1980-1996 beginning baseline measurement period for the Hypoxia Action Plan, the gauge for the INRS. Learning more about the differences between these two methods of measuring water quality changes will contribute to our understanding of practice and structure adoption impact on water quality over time, but already, there's a growing recognition of increased contributions from stream bank and bed erosion due to weather-influenced flow that needs to be better understood.*

This is one example of how the results summary in the initial pages of the report can detail how Iowa farmers and cities have accepted the new national and state challenge of reducing phosphorus *and* nitrogen in surface water. More graphics and the use of experienced technical writers would help tell this story in a way that the public, policymakers and the media can appreciate. The periodic report can then go into more detail on each of these indicators of desirable change.

The report also provides a great opportunity to outline the long-term vision for the INRS and its underlying WQI implementing program. It seems that IDALS, DNR and ISU could use a report to share highlights of how they plan to "ramp up" the WQI in the future.

Understanding that most Iowans, policymakers and the media are not going to read the entire report, more detail can then be shared in later sections, such as the challenges associated with measuring change, including data availability, year-to-year trends, the applicability of various measures, the overall effect of weather on results, and stream bank/bed erosion and its contribution to nutrient loading.

The IFBF recommends adopting such a format now and use in future reports.

Other recommendations for the report include:

- The report should focus on comparing current activity with the 1980-1996 baseline; the 2006-2010 benchmark was developed for pre-INRS economic costs estimates, not for reporting or for comparison of practice adoption.
- It is most appropriate to compare historic land use changes to the 1980-1996 baseline period. Prior historic land use changes were influenced by other factors not relevant to the programs, inputs and results of the INRS and the WQI.

Thank you for the opportunity to comment on the draft report.

Sincerely,

Rick Robinson
Conservation & Natural Resources Policy Advisor
Iowa Farm Bureau Federation

Cc: Mike Naig, Iowa Secretary of Agriculture
Kayla Lyon, DNR Director
Wendy Wintersteen, President, Iowa State University

Comments on INRS 2018-2019 Annual Progress Report

Mike Tate, PE/Doug Jones

March 10, 2020

1. Page 20 last paragraph – Suggest the following addition just to give the casual reader a more impactful understanding of the role of agriculture in IA.

   "Land use change
   Iowa's land use in 2018 and historically

   Iowa's total land area is 35.7 million acres. The state's land is dedicated primarily to agriculture; total agricultural land—as reported by the US Department of Agriculture (USDA) Census of Agriculture—has averaged 33 million acres since 1920, with a range of 30.6 million acres in 2012 to 34.5 million acres in 1945 (Figure 8). Thus, over 90% of Iowa's total land area is dedicated to some facet of agriculture. The land area dedicated to field crops—corn, soybeans, and other annual and perennial crops—has remained relatively steady since 1920, averaging 26.6 million acres. During that time, statewide pasture acres have decreased from a high of 11 million acres in 1935 to a low of 2.5 million acres in 2012."

2. Page 30 Wetland. In the past there have been discussions about clearly differentiating "treatment wetlands" from the wetlands referred to in the report. Treatment wetlands generally refer to wetlands used to treat wastewater regulated under the Clean Water Act and are not allowed in perennial streams. They must be upland. Clearly, the wetlands described in the report fall outside this scope, but the terminology used may cause unwanted confusion – for example the first sentence on Page 30:

   Wetlands that treat agricultural drainage for the reduction of nitrogen export have an effectiveness of 52 percent reduction and are primarily constructed through the Conservation Reserve Enhancement Program (CREP)

   An example of alternative language might be:

   Wetlands that capture agricultural drainage have an effectiveness of 52 percent nitrogen export reduction and are primarily constructed through the Conservation Reserve Enhancement Program (CREP).

   We realize treatment is referenced numerous times throughout the section. We would suggest considering the removal of these references, and replace with different terminology (water quality wetlands, reduce nitrogen from X number of acres, etc.). However, we also realize that this terminology of "treatment" or "acres treated" is used to describe the other edge of field practices contained in the document – so this may not be something the authors want to tackle, if it impacts the intent. This is simply brought up as item to consider.

3. Page 33, Table 5. See copy on page 4.
    a. I did not find a reference to Table 5 in the text, thus no explanatory information about what it is and what it is demonstrating.
    b. It seems to be a comparison between the "Number Required" and the "Number Complete".
        i. The "Number Required" side of the table looks like it shows cumulative values year-to-year – with the exception of the "Feasibility studies submitted" row which appears to be year-by-year values. The "Number Complete" side of the chart, some values seems to show non-cumulative, year-by-year numbers (Permits Issued), while others are cumulative (Permits meeting reduction targets). If that is the case, then it makes it challenging to compare the two. Would suggest making all year-to-year cumulative, or year-by-year non-cumulative if idea is to compare. Would probably want a "Total" column on the "Number Required" side if comparing.

        ii. If this is to be a comparison, the "Permits with limits" indicates a significant difference. Did not find discussion on this in the text. Seems like it would be important.

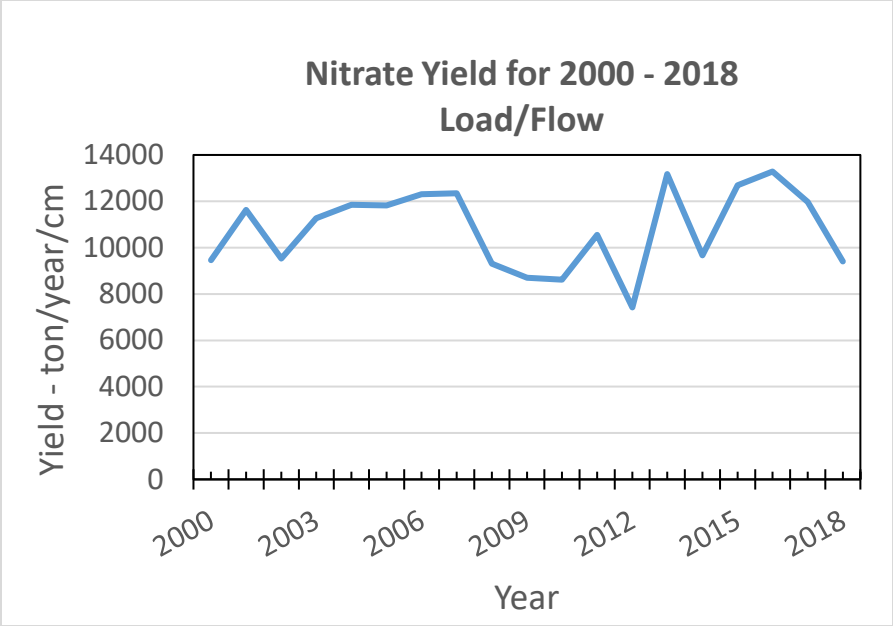
4. Page 34, Figure 17 – the title state there are 152 facilities affected by the NRS which matches the text in paragraph 2 on Page 34 and Table 5. The pie chart indicates 155 facilities – 22+133. Need to check on correct numbers.

5. Page 37, Figure 19 – may be similar issue to comment 3, above – the numbers of facilities in the pie chart adds to 153. Seems like either 152 or 155 as discussed above.

6. Page 38, Table 6 facilities amended with construction schedules- indicates 39 total facilities – 29 muni + 10 industrials. Table 5 indicates a total of 40.

7. Page 52, Figure 23 and Page 53, Table 12. Each of these indicate a flow in units of "cm" or centimeter which is not typically thought of as a flow. As IDNR explained, it is flow in the sense that it is x number of centimeters of rainfall projected to runoff in a year's time over the entire state. It would be good to include that explanation in the text.

    In addition, I am concerned the information provided in the graphs only gives a portion of the story, and to the casual observer they may read that the export is always on the increase – the graphs are always rising. I am not sure we can make that conclusion. I took the data and added a column for "Nitrate Yield" (tons N/year/cm) – the load (Col B) divided by the "flow" (Col C) – see page 5. That produces the following graph:



While the units may not mean much to people, it does show that yield is fairly steady yield which means rainfall almost exclusively drives the load values, which is the point that I think is trying to be made. That means there could be progress in keeping nitrate on the land, which could be obscured in years with above average rainfall.

Just food for thought.

Table 5. Summary of NRS point source implementation.

Metric	Number Required						Number Complete						
	2013-14	2014-15	2015-16	2016-17	2017-18	2018	2013-14	2014-15	2015-16	2016-17	2017-18	2018	Total
Permits issued				151	154	152	21	32	29	24	20	14	133
Permits issued in targe watersheds				39	39	39	3	7	9	3	3	3	32
Feasibility studies submitted				30	27	31	0	1	19	31	31	25	94
Permits with construction schedule	-	-	-	-			0	0			12	19	40
Permits with limits	130	147	149	150	152	146	0	0	1	38	46	49	49
Nitrogen		-	-	-	-	-	-	-	1	38	44	47	47
Phosphorus	-	-	-	-	-	-	-	-	1	5	8	8	8
Permits meeting % reduction targets	-	-			-	-	-	-	-	-	-		-
Nitrogen	-	-			-	-	-	9	14	19	24	29	29
Phosphorus	-	-	-	-	-	-	-	2	6	9	11	13	13
Total permits with nutrient monitoring (including those not in nutrient strategy)	-	-	-	-	-	-	169	201	224	344	399	388	388

Are these two groups compared? If so, should there be some explanation as to why large discrepancy?

Yr-by-Yr

Cumulative

Table 12 modified

Year	Nitrate-N Load (tons N/year)	Flow (cm)	Load Per Acre (pounds)	Nitrate Yield tons/yr/cm
2000	101,298	10.71	5.6	9458
2001	300,428	25.83	16.7	11631
2002	115,070	12.07	6.4	9534
2003	144,049	12.78	8.0	11271
2004	264,357	22.3	14.7	11855
2005	186,995	15.81	10.4	11828
2006	174,990	14.22	9.7	12306
2007	450,132	36.46	25.0	12346
2008	434,611	46.69	24.1	9308
2009	281,029	32.3	15.6	8701
2010	455,312	52.84	25.3	8617
2011	297,246	28.19	16.5	10544
2012	66,189	8.92	3.7	7420
2013	342,921	26.04	19.0	13169
2014	267,053	27.61	14.8	9672
2015	417,793	32.92	23.2	12691
2016	531,776	40.03	29.5	13284
2017	318,111	26.56	17.7	11977
2018	426,416	45.33	23.7	9407