The Iowa Nutrient Reduction Strategy: Ten Years and No Progress

Iowa Environmental Council

INTRODUCTION

What is a Nutrient Reduction Strategy?

Rivers, streams, and lakes across Iowa are polluted with nitrogen and phosphorus. In small quantities, these are nutrients for growing plants. But in large quantities, they pollute the water by promoting growth of algae, harming aquatic life, and limiting use of drinking water. Nearly all of these nutrients come from manure and synthetic fertilizer used for agricultural production.

State law does not require agricultural operations to prevent water pollution. Instead, Iowa adopted a statewide Nutrient Reduction Strategy (NRS) in 2013 to satisfy U.S. EPA policy addressing nutrients.[i] The NRS includes required actions for some sources of nutrient pollution, but only voluntary measures for agriculture. This voluntary policy has not resulted in progress. Iowans have suffered the consequences, ranging from the increased risk of serious health issues, including cancer, to unsafe recreational waters. Based on the failure of the voluntary policy, the state must revise its approach to make progress.

State leaders and decision-makers must adopt changes that will lead to actual reductions of nutrients. We have the scientific basis for progress, but have not had the policy to make it happen. This white paper incorporates input from researchers and scientists to recommend timelines and other NRS revisions that would accelerate progress toward the goal of cleaner water.

BY THE NUMBERS

22,325

Years to reach Scenario 1 goal

$32m

Possible annual savings using Maximum Return to Nitrogen formula

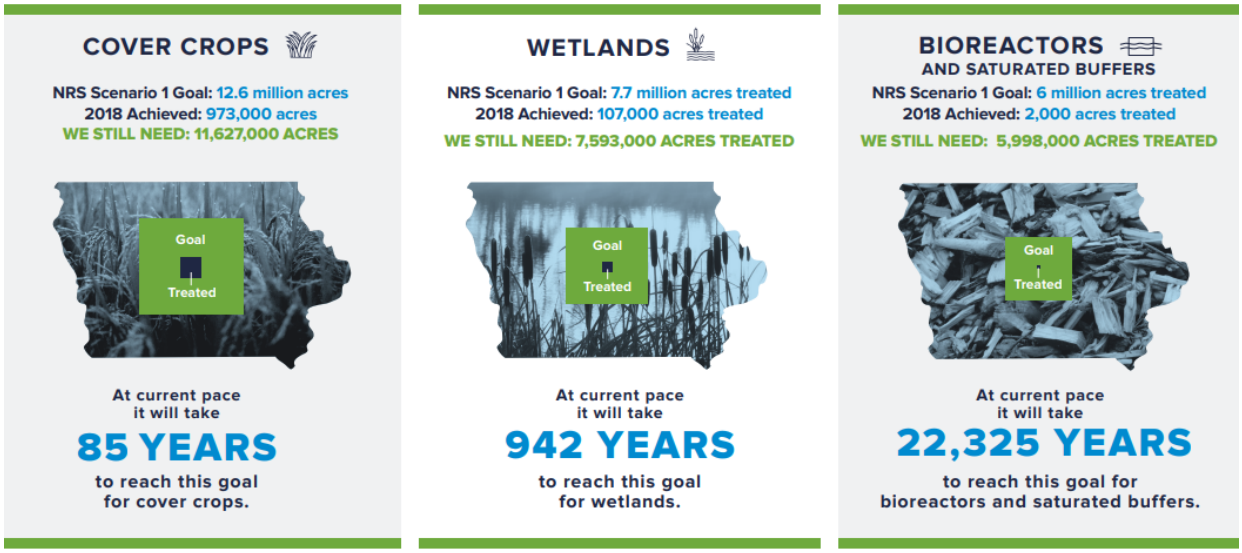
7

Recommendations to update the NRS

Missing Pieces of the NRS

Iowans need nutrient reductions in waters statewide to ensure clean water for Iowans to drink, enjoy, and explore. IEC has regularly reviewed and provided feedback on the state's implementation of the NRS. This has included publications evaluating the progress reporting and highlighting the deficiencies of implementation to date.[ii] IEC has also recommended broader changes to state policy that would achieve greater reductions.[iii]

Iowa's NRS is missing a key component to evaluate and drive progress: a timeline for meeting the reduction targets, or at least milestones to trigger reassessment. The strategy was published in 2013 and the Iowa legislature adopted the NRS as the official state policy to address nutrients in 2018.[iv] But the state agencies responsible for the NRS have not reassessed the approach to nutrient reductions, even as progress has been minimal or negative.



Source: Annual Progress Reports, Iowa Nutrient Reduction Strategy, 2016-2019.

As we approach the ten year anniversary of the NRS, Iowans deserve to know whether taxpayer spending is on track to achieve our goals. Based on the lack of measurable progress in the first ten years, we need to reassess our approach.

Without any timeline to assess progress toward the goal, the state has failed to prioritize actions to make progress at a reasonable pace. Nor has the state made policy changes necessary to accelerate progress. IEC analysis has shown that at the current pace of progress, the timeline to meet state goals is untenable. Iowa is on track to meet the first scenario in the NRS 22,325 years from now.[v]

Iowa is on track to meet the first scenario of the NRS in

22,325 YEARS

The extended timeline does not result from technological infeasibility. IEC sought input from scientific experts, who consistently said that the reduction targets are possible to meet with existing technology – but they require larger-scale changes across the landscape. Setting goals will lead agencies to prioritize the practices that are most efficient and cost-effective to implement. The NRS needs to set goals, identify mechanisms to achieve them, and include a plan to measure progress.

Neighboring states have set targets to guide implementation and provide a basis for reevaluation. Minnesota and Illinois both set reduction benchmarks for 2025. Staff from the Minnesota Pollution Control Agency expect to evaluate progress and reevaluate the strategy as the state approaches its interim benchmarks.

Implementation to Date

State agencies and Iowa State University produce an annual update on the progress toward achieving the NRS goals, which calculates the number of practices installed based on data reported to state or federal agencies.[vi]

ISU has created a dashboard to display the progress on a more frequent basis, but as of July 2022, it had not been updated since it was first launched in the summer of 2021.[vii]

IEC recently evaluated the state's monitoring in *Water Quality Monitoring and the Water Quality Initiative*.[viii] The report found that the state has not adequately collected and reported monitoring data; it recommends developing a collaborative monitoring framework to assess water quality and to use the results to inform the NRS.

RECOMMENDATIONS

Since the NRS was adopted, IEC has regularly called for changes that would improve its efficacy and lead to nutrient reductions.[ix] Unfortunately, the NRS has not incorporated changes necessary to make timely progress.

IEC developed recommendations for updating and implementing the NRS based on the NRS implementation to date and input from scientific experts. These recommendations would allow the state to adopt and meet a reasonable timeline to achieve significantly better water quality. Several have been suggested in the past, but never adopted.

Recommendation	Status
Adopt timelines for progress	Not adopted
Identify consequences for failing to meet targets	Not adopted
Conduct a ten-year review to prioritize practices	Not adopted
Identify practices to adopt universally	Not adopted
Implement a targeted watershed demonstration project	Not adopted
Develop a monitoring approach for targeted watersheds to track nutrient reductions	Not adopted
Adopt numeric nutrient criteria	Not adopted

Incorporating these recommendations would not singlehandedly solve Iowa's water quality issues: the scope of the Nutrient Reduction Strategy does not include the imbalance between private and public rights, transparency of information, and the rapid expansion of livestock operations as IEC discussed in *Policy Solutions to Actually Reduce Nutrient Pollution in Iowa's Water*.[x]

Incorporating the recommendations listed previously would lead to a more effective plan and would accelerate the pace of progress toward the nitrogen and phosphorus goals set by the state and U.S. EPA. A recent U.S. EPA memo states that the agency will review state NRS documents.[xi] These recommendations could be criteria for EPA's review.

1. Adopt Timelines for Progress

The absence of a timeline to achieve the goals in the NRS is a glaring deficiency that has been raised repeatedly since the first public notice of the NRS. IEC has heard from water quality experts that Iowans expect the state's strategy to include a timeline. Despite calls to do so, the NRS has never explicitly set a timeline to meet its reduction targets. The lack of progress to date underscores the need for a timeline and accountability.

IEC reviewed nutrient reduction goals in other states and developed a timeline that could be achievable with appropriate changes to policy and funding. The NRS should have adopted goals for nitrogen and phosphorus in 2013 to meet the Hypoxia Task Force's 2035 target, such as the approach adopted by Illinois. Like Iowa, Illinois adopted the baseline loading from 1980-1996 used by the U.S. EPA's Gulf Hypoxia Task Force when setting regional goals. Minnesota had an even more aggressive timeline with larger reductions by 2025, in part due to substantial progress already achieved for phosphorus.

ILLINOIS TIMELINE FOR NRS TARGETS

	Phosphorus	Nitrogen
1980-1996 baseline	0	0
2025	25%	25%
Final goal	45%	45%

MINNESOTA TIMELINE FOR NRS TARGETS

	Phosphorus	Nitrogen
1980-1996 baseline	0	0
2014 baseline	33%	0
2025	45%	20%
2040	45%	45%

Because Iowa's NRS did not set any benchmarks or timeline in 2013, the state has not assessed whether it is on track to meet its goals in a timely fashion. To prevent this delay from happening again, we need to set benchmarks and actually try to reach them.

The NRS contained a science assessment of potential reductions from adopting best management practices. The NRS also contains scenarios by which the state could achieve the nutrient reduction target of 45 percent. Using these benchmarks, Iowa could adopt a timeline like the one below.

IEC PROPOSED TIMELINE FOR NRS TARGETS

	Phosphorus	Nitrogen
2006-2010 (pre-NRS baseline)	18.5%	(5.3%)
2030	25%	15%
2040	45%	45%

The revised timeline is premised on achieving basic steps suggested in the NRS. First, ensuring that fertilizer is applied at the economically optimal rate (the maximum return to nitrogen or soon-to-be-revised land grant university recommended rate[xii]) would achieve approximately a 9 percent reduction.[xiii] Actions such as cover crops could reduce fertilizer losses soon after they are adopted. These could be completed by 2030. Development of larger-scale actions, such as wetland restoration across larger areas of the state, could take more time to fund and implement. The trajectory of reductions reflects these shifts in approach.

The proposed benchmarks align with those in neighboring states. Both Minnesota and Illinois set interim goals for 2025. Minnesota's target date for achieving its 45% reduction goal for nitrogen is also 2040. These are "stretch" goals that present a challenge, but are possible to achieve based on the NRS science assessment. They do not meet the goal of the Gulf Hypoxia Task Force to achieve reductions by 2035, but Iowa's delay in adopting targets and lack of progress to date make it extremely unlikely to meet that deadline.

The scientific experts IEC consulted generally agreed that the challenge to achieving the reduction goals is not technological. The NRS identified practices that should, cumulatively, achieve the goal. But implementation will require widespread changes to land management, which have been voluntary for nonpoint sources.

Minnesota's approach provides an avenue to make greater progress. Minnesota has substantial dedicated funding for water quality, a strong monitoring network and plan, modeling and analysis of nonpoint source pollution mitigation, and required best management practices for agricultural production.

2. Identify consequences for failing to meet targets

Iowa has relied on voluntary practices for nonpoint source pollution for many decades without success. As shown by the lack of progress on the NRS and the historical trends for water quality in Iowa, the state needs to adopt a different approach to achieve its water quality goals.

The Clean Water Act imposed mandatory controls on most point sources fifty years ago, leading to rapid and significant reductions in pollution from those sources. That effort demonstrates the effectiveness of imposing requirements with consequences to improve water quality. In other states, requirements for nonpoint sources of pollution have led to similarly high compliance rates.

For example, Minnesota adopted requirements for buffers along public waterways. It has now achieved approximately 99.6 percent compliance with the requirement.[xiv]

Photo courtesy of Lynn Betts, USDA NRCS

The Clean Water Act maintained the voluntary (and publicly-subsidized) effort to reduce nonpoint sources. Failing to achieve those goals has externalized costs, pushing them on to Iowans and others downstream from the pollution sources.

The NRS has provided an opportunity to test whether voluntary compliance can achieve Iowa's water quality standards. Failing to meet benchmarks in the NRS should trigger requirements to adopt practices that the NRS science assessment has shown will achieve water quality improvement. Refusing to do so at this point amounts to an admission that the state has abandoned its duty to protect public waters for the public interest.

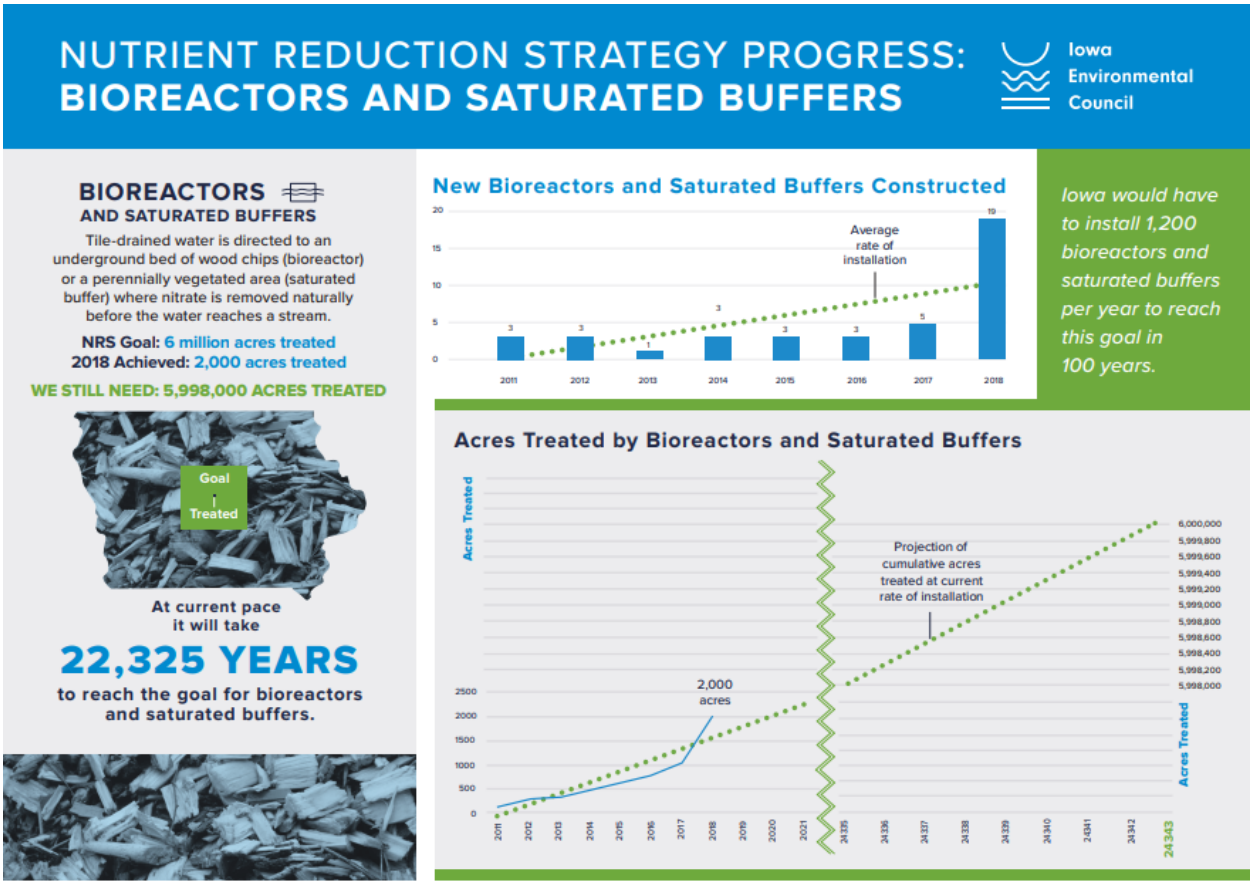
Minnesota has buffer requirements and achieved

99.6% compliance

3. Conduct a ten-year review to prioritize practices

One of the first steps the state should undertake is a review of the practices in the NRS and the implementation progress. The NRS provides a wide-ranging assessment of the effectiveness of agricultural practices for reducing nitrogen and phosphorus based on the best available information at the time the NRS was written. The NRS scientific advisory panel meets as needed to update the practice assessment to reflect updated science and approve new practices for inclusion as "NRS" practices.

The assessment is based on scientific study of the practices, but does not address the feasibility of implementation at the scale needed to achieve the water quality goals. A telling example is the adoption of bioreactors under Scenario 1. The scenario lists a combination of practices that would reach the 45 percent reduction goal and includes bioreactors treating 6 million acres of row cropland. As of 2018, the most recent data available, bioreactors have treated 2,000 acres. Most reactors treat a single field or a few fields, meaning that the state would need to install tens of thousands of bioreactors to achieve the goal. The most installed in one year is 19.



Source: Annual Progress Reports, Iowa Nutrient Reduction Strategy, 2016-2019.

Polk County has undertaken an effort to install 50 bioreactors through a single approval process, substantially increasing the implementation rate at a local scale. But as IEC previously found, "Iowa would have to install 1,200 bioreactors and saturated buffers per year to reach this goal in 100 years."[xv]

Bioreactors also require substantial implementation costs – which have often been borne by the public – and have a limited duration. Iowans cannot afford to pay for the installation and ongoing maintenance of the practice. The scale of recent and planned installation, upfront cost, and ongoing maintenance prevent these from being feasible on the scale proposed in the NRS.

To remedy this issue, the NRS collaborators should assess what practices offer the most opportunity for success on a shorter time scale. Cover crops, for example, have been adopted at a slightly faster rate and could be implemented at lower cost than bioreactors. The NRS should also prioritize practices that provide multiple benefits. Practices that add perennials and hold water on the land can provide benefits beyond nutrient reduction, such as reduced flooding and greenhouse gas emissions.

One aspect of the NRS to revisit is the logic model, which presumed that education would lead to implementation. While the social/human elements are essential components of large-scale change, the NRS presumed that education would lead to action. Despite investments in education over the last ten years, and data showing awareness of the NRS, that knowledge has not led to action. The NRS collaborators should assess what other actions or consequences would lead to the changes necessary to meet the state's goals.

An additional challenge resulting from the lack of broad participation is that stacking benefits have less effect on nutrient loading.[xvi] In other words, reducing nutrients through one practice means that other practices will have less effect – there are fewer nutrients to reduce. A broader set of nonpoint sources will have to participate to achieve 45 percent reductions.

4. Identify practices to adopt universally

Several practices identified in the NRS could be adopted universally, or nearly so, in a short time with limited cost. The NRS provided three example scenarios to achieve the nutrient reduction goals, but did not necessarily address the feasibility of achieving

the scenarios on a reasonable timeframe. The science team should update these scenarios to reflect the feasibility based on the lessons from implementation since the NRS was adopted.

One of the fundamental assumptions in the NRS was the economically optimal application of nitrogen fertilizer. All three scenarios assumed that the "maximum return to nitrogen," or MRTN, would be used statewide by farmers. This practice would reduce production costs because nitrogen is over-applied statewide, even though that is more costly than optimal application.

Experts widely agree that achieving optimal nitrogen application should be an immediate (or initial) practice. IEC recommends that if adoption is not at 100% implementation by 2030, then the NRS and the state should require and enforce compliance. This practice is one of the only recommended practices with immediate cost savings as well as long-term benefits. The NRS summarized these benefits:

> "Implementing the nitrogen rate reduction to the MRTN on all corn-soybean and continuous corn acres is estimated to have the potential to reduce nitrate-N loading by 28,000 tons/year, which is about a 9% overall load reduction at an annual cost of approximately $-32,308,000 (a net economic benefit) (Table 14)."[xvii]

Applying at optimum rates would require proper accounting of nutrients in manure. Iowa has thousands of animal feeding operations that produce manure with value as a fertilizer, but does not provide adequate oversight of manure application rates and timing. The NRS failed to address this issue in determining how to meet reduction goals.

The NRS scenarios also proposed widespread adoption of three practices to address millions of acres: cover crops, treatment of runoff by wetlands, and bioreactors.[xviii] Riparian buffers were added as an equivalent practice to bioreactors in the 2017 update to the strategy.[xix] The state should determine how to ensure adoption of cover crops on all available land.

Minnesota's experience with riparian buffers demonstrates that riparian buffers do not prevent robust agricultural production. Minnesota has achieved nearly universal compliance with agricultural buffers in just a few years.[xx] To encourage implementation, Minnesota coordinated with federal programs such as the Conservation Reserve Program (CRP) to facilitate the transition away from cropped land. Buffers provide multiple benefits such as wildlife habitat, especially if their width is expanded through

CRP or other programs.

The state should also devote resources to determining how to adopt widespread wetland treatment systems, which were assumed to treat millions of acres in all three scenarios. Wetlands also provide multiple benefits, such as holding water on the land to reduce downstream flooding.

5. Implement a targeted demonstration project

Water quality data across Iowa have shown that the NRS has not made progress toward the Hypoxia Task Force's reduction goals. Since the 2006-2010 baseline before adoption of the NRS, nitrate concentrations and loads have increased. Phosphorus reductions have only been modeled, not measured based on actual load data. The NRS authors have only reported progress at a statewide scale, rather than watershed scale.

Under the current system of cost-sharing, in which the public pays for 75 or 100 percent of conservation costs, the NRS estimated total initial investment costs of $1.2 to 4 billion, with ongoing costs between $77 million and $1.2 billion annually.[xxi] Current state funding for water quality projects is far smaller than those costs, which the lack of progress reflects. If Iowa continues to rely on cost-share to implement conservation, a targeted program is the only way to demonstrate the validity of the NRS assumptions.

The NRS identified nine HUC-8 scale watersheds to target.[xxii] Despite U.S. EPA's call to target efforts at a small scale (as small as HUC-12),[xxiii] state funding has supported watershed efforts in many parts of the state, not just those identified in the NRS.[xxiv] Nor is state funding adequate to fully invest in those watersheds. These nine watersheds represent more than 16 percent of the 56 HUC-8 watersheds in the state, but state funding is far less than 16 percent of the $1.2 to $4 billion necessary to implement the strategy.

The strategy should identify smaller-scale watersheds (e.g., HUC-12) that would allow a more complete adoption of practices to demonstrate the effectiveness of a combination of practices.

Under the current cost-sharing system, the public pays

75 - 100% of costs

6. Develop a monitoring approach for targeted watersheds to track nutrient reductions

Monitoring progress is essential to assess effectiveness of implementation practices and to demonstrate that the state is meeting its goals. Iowa has not developed targeted, consistent, public monitoring to assess effectiveness of implementation measures in the watersheds prioritized in the NRS.

Iowa has monitoring stations that collect regular data from large waterbodies, which aggregate the nutrient loading from nonpoint sources statewide. However, the ambient monitoring network does not capture the targeted actions within the nine HUC-8 watersheds prioritized in the NRS.

The NRS collaborators developed a "Stream Water-Quality Monitoring Conducted in Support of the Iowa Nutrient Reduction Strategy," which summarized stream monitoring efforts statewide.[xxv] These monitoring efforts largely predate the NRS adoption, though many do include nutrient monitoring.

IEC found in that the statewide monitoring networks were not designed to assess progress for the NRS, lack the frequency and spatial arrangement necessary to identify water quality changes attributable to NRS implementation, and therefore have not provided accountability for public spending.[xxvi]

7. Adopt numeric criteria by 2024

The federal Clean Water Act requires states to set water quality standards, which include uses for the state's surface waters, criteria necessary to protect those uses, and limits on degradation of the water. Iowa's designated uses include protection for aquatic life and recreation on most waters of the state.[xxvii] Iowa has also designated many waters to be protected as drinking water sources.[xxviii]

To protect recreational use, aquatic life, and drinking water uses, Iowa has adopted narrative criteria for nutrients. The criteria prohibit "floating debris, oil, grease, scum and other floating materials attributable to wastewater discharges or agricultural practices in amounts sufficient to create a nuisance."[xxix] An alternative approach to these "narrative" criteria are numeric criteria, which determine the concentration of pollutants that prevent the use from being met. U.S. EPA has recommended for decades that states adopt numeric criteria, because they provide a clear, measurable quantity of pollution allowed. In contrast, narrative criteria can be subject to interpretation.

U.S. EPA issued recommendations for numeric nutrient criteria in 2021.[xxx] The

recommendations included a case study using Iowa data to demonstrate how the recommended criteria could be applied and adopted by a state.

The NRS identified numeric nutrient criteria as a long-term policy goal.[xxxi] Now is the appropriate time to take action on developing and adopting state criteria. States can adopt water quality standards at any time, but at a minimum must consider EPA's recommended criteria as part of each state's three-year evaluation of their water quality standards.[xxxii] Iowa last evaluated its standards in 2021, adopting a plan for water quality standards at nearly the same time EPA issued its final recommendations.[xxxiii] Therefore, Iowa must consider whether to adopt numeric criteria by 2024. Iowa should use EPA's recommendations to adopt numeric criteria.

CONCLUSION

Iowa's NRS contains a strong scientific analysis showing the steps the state could take to achieve its nutrient reduction goals. However, it lacks the timelines or interim benchmarks that drive implementation on a scale necessary to make measurable progress. The NRS authors should conduct a ten-year review to adopt changes to the strategy that will lead to actual nutrient reductions. By adopting these recommendations , the NRS could result in real progress toward water quality goals set by Iowa and U.S. EPA.

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