COLORADO
Water Quality Control Division
Department of Public Health & Environment

Colorado Nutrient Control Strategy

Progress Report

Nutrients Management Control Regulation
Regulation #85 (5 CCR 1002-85)

and

Section 31.17 of The Basic Standards and
Methodologies for Surface Water
Regulation #31 (5 CCR 1002-31)

September 9, 2015

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Acronyms

BMP	best management practice
BNR	biological nutrient removal
CDPHE	Colorado Department of Public Health and Environment

CDPS	Colorado Discharge Permit System
CDSN	Colorado Data Sharing Network
CLEAN	Center for Comprehensive, Optimal and Effective Abatement of Nutrients
CSU	Colorado State University
DUWS	Direct Use Water Supply
DWWTW	domestic wastewater treatment works
eBNR	enhanced biological nutrient removal
EMC	Event Mean Concentration
EPA	Environmental Protection Agency
EQuIS	Environmental Quality Information System
eRAMS	Environmental Risk Assessment and Management System
mgd	million gallons per day
MS4	municipal separate storm system
NADP	National Atmospheric Deposition Program
NRCS	Natural Resources Conservation Service
PEL	Preliminary Effluent Limit
SAP	Sampling and Analysis Plan (SAP)
SIC	Standard Industrial Classification
SPAN	South Platte Agricultural Nutrients
SWAT	Soil and Water Assessment Tool
TRIH	Triennial Review Informational Hearing

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Section 1
Introduction and Background

Nitrogen and phosphorus are nutrients that are a part of all aquatic ecosystems and are necessary to support the growth of the algae and aquatic plants that provide food and habitat for fish and smaller aquatic organisms. However, excess nitrogen and phosphorus, or nutrient pollution, can result in serious water quality problems. It impairs drinking water, endangers aquatic life, and threatens recreational uses. Nutrient pollution can also pose serious risks to human and animal health and damage to the economy. Too much nitrogen and phosphorus in the water causes algae to grow faster than ecosystems can handle. Large growths of algae are called algal blooms. Some algal blooms are harmful to humans because they produce elevated toxins and bacterial growth that can make people sick if they come into contact with polluted water, consume tainted fish or shellfish, or drink contaminated water. Algal blooms can severely reduce or eliminate oxygen in the water, leading to illnesses in fish and the death of large numbers of fish.

In June 2012, the Colorado Water Quality Control Commission (commission) adopted nutrients regulatory provisions composed of two major components:

1. A new Nutrients Management Control Regulation establishing technology-based treatment requirements for many domestic and some industrial wastewater dischargers, enhanced nutrients control requirements for storm water dischargers, provisions encouraging voluntary controls of nonpoint sources, and monitoring requirements to develop better information to refine Colorado's nutrients management efforts over time. This control regulation is called Regulation #85.

2. Scientifically-based numerical values for nutrients at levels to protect classified uses of Colorado waters. These are initially to be applied only to streams and lakes above dischargers and to protect municipal water supplies taken directly from lakes or reservoirs. Section 31.17 of Regulation #31 contains the numerical values.

The new rules became effective September 30, 2012.

1.1 Regulation #85 Nutrients Management Control Regulation

Regulation #85 contains a number of requirements. It includes provisions that:

- Establish technology-based treatment requirements for large domestic and some industrial wastewater dischargers.
- Establish enhanced nutrients control requirements for storm water dischargers.
- Encourage voluntary controls of nonpoint sources.
- Establish monitoring requirements to develop better information to refine Colorado's nutrients management efforts over time.

Regulation #85 requires certain large wastewater treatment facilities to meet effluent limits for phosphorus and nitrogen based on levels determined to be achievable with available

technology. It focuses control requirements on the major sources of nutrient pollution in Colorado and includes provisions to fine-tune application of the new treatment requirements. For example, there are exceptions for small facilities, delays for medium facilities, and exclusions for facilities in disadvantaged communities and facilities that have minimal impacts. Regulation #85 contains a voluntary approach for agriculture and other nonpoint sources, with the potential for additional regulatory requirements after ten years if needed. It also includes monitoring requirements that will develop better information for future nutrients management decision making.

From 2012 to 2022, the Regulation #85 effluent limits only apply to Colorado's largest domestic wastewater and some industrial dischargers. This includes domestic facilities that have a design capacity of over 2 million gallons per day (mgd) and that are located in a high priority watershed. High priority watersheds are those areas with a high ratio of treated wastewater flow per square mile, which encompasses the highly urbanized areas in the Front Range and the most urbanized areas of the west slope. Currently, forty-five domestic facilities in Colorado meet both of those criteria. There are significant environmental benefits derived from this framework since 90 percent of the domestic wastewater flow comes from the larger facilities. The effluent limits in Regulation #85 do not apply to domestic wastewater facilities with a design flow of less than or equal to 1 mgd or facilities owned by a disadvantaged community. For the first 10 years of the regulation, facilities with a design flow of greater than 1 mgd and less than or equal to 2 mgd are exempt from effluent limits, as are facilities greater than or equal to 2 mgd that are in non-priority watersheds. After 2022, the limits will only apply to a total of 99 domestic facilities.

Regulation #85 requires all domestic wastewater facilities to monitor their effluent. Facilities with a design flow greater than 1 mgd or are not located in an economically disadvantaged community are also required to conduct instream nutrient monitoring above and below their effluent discharge. The receiving water monitoring requirements apply to approximately 99 domestic facilities. The effluent limits in Regulation #85 were set at levels that could be achieved with a three-stage biological nutrient removal (BNR) process but without new technology or reverse osmosis. The cost of implementing these limits is significantly less than original estimates since numerous facilities can meet the limits by optimizing existing process without the need for large capital improvement projects. The limits are two separate measurements and not a reduction from the statewide average, as represented by a percentile and median numeric effluent limit (see Table 1 for details).

Table 1 Regulation #85-Nutrient Effluent Limits (for facilities over 2.0 mgd in high priority watersheds)

Parameter	Annual Median[1]	95th Percentile[2]
Total Phosphorus	1.0 mg/L	2.5 mg/L
Total Inorganic Nitrogen[3] as N	15 mg/L	20 mg/L

[1]Running annual median of all samples taken in the most recent 12 calendar months.
[2]The 95th percentile of all samples taken in the most recent 12 calendar months.
[3]Determined as the sum of nitrate as N, nitrite as N, and ammonia as N.

1.2 Regulation #31 Interim Numeric Values

Regulation #31(the Basic Standards and Methodologies for Surface Waters) was revised to include interim numerical values for phosphorus, nitrogen, and chlorophyll *a* for rivers, stream, lakes and reservoirs as summarized in Table 2. The numerical values are based on the maximum amounts of each pollutant that can be present in water and still protect the classified use.

Table 2 Interim Numeric Values for Total Phosphorus, Total Nitrogen, and Chlorophyll *a*

Parameter	Rivers and Streams		Lakes and Reservoirs		
	Cold	Warm	Cold	Warm	Direct Use Water Supply
Total Phosphorus	110 ug/L[(1)]	170 ug/L[(1)]	25 ug/L[(2)]	83 ug/L[(2)]	not applicable
Total Nitrogen	1,250 ug/L[(1)]	2,010 ug/L[(1)]	426 ug/L[(2)]	910 ug/L[(2)]	not applicable
Chlorophyll *a*	150 mg/m^2 [(3)]	150 mg/m^2 [(3)]	8 ug/L[(4)]	20 ug/L[(4)]	5 ug/L[(5)]

[(1)]Annual median, allowable exceedance frequency 1-in-5 years
[(2)]Summer (July 1 – September 30) average in the mixed layer of lakes (median of multiple depths), allowable exceedance frequency 1-in-5 years
[(3)]Summer (July 1 – September 30) maximum attached algae, not to exceed.
[(4)]Summer (July 1 – September 30) average chlorophyll *a* in the mixed layer of lakes (median of multiple depths), allowable frequency 1-in-5-years.
[(5)]March 1-November 30 average chlorophyll *a* in the mixed layer of lakes (median of multiple depths), allowable frequency 1-in-5 years.

These numerical values can be considered for the adoption of standards for individual water bodies in phases. Adoption of standards during the first phase will protect waters upstream of current dischargers and protect direct use water supply (DUWS) reservoirs. During the first phase, from 2012-2017, the commission can consider adopting standards for phosphorus or chlorophyll *a* to protect aquatic life, recreation, and water supply uses only in the following specific circumstances:

- In headwaters upstream of existing dischargers.
- In DUWS Lakes and Reservoirs where this type of protection is determined to be appropriate (chlorophyll *a* only).
- Under other circumstances where the commission determines Regulation #85 will not provide sufficient control of nutrients.

From 2017-2022, the commission will continue to consider adoption of standards as above, and can also consider adopting nitrogen standards in the same circumstances outlined above. Starting in 2022, the commission can consider adopting numerical water quality standards for phosphorus and nitrogen for all Colorado surface waters as appropriate, based on the information developed under the first phase.

1.3 Stakeholder Outreach

Since fall 2014, the Water Quality Control Division (division) has hosted a series of stakeholder meetings to discuss the upcoming triennial review hearing for Regulation #85 by the commission. These meetings were held on:

- September 29, 2014
- January 26, 2015
- June 23, 2015
- August 17, 2015

The purpose of the stakeholder meeting was to keep concerned parties informed about the development of this memorandum, implementation of the Regulation #85 and 31.17 of Regulation #31, and the division's recommendations to the commission about regulation revisions.

1.4 Progress Report Overview

The progress report is organized into four sections:

- **Section 1 -** Introduction and Background
- **Section 2** - Progress on Implementation of Regulation #85
- **Section 3** - Progress on Implementation of Section 31.17 of Regulation #31
- **Section 4** – Recommended Changes to Regulation #85 and 31.17 of Regulation #31

Section 2
Progress on Implementation of Regulation #85

This section summarizes the division's progress on implementing Regulation #85. It includes a discussion on efforts to implement technology-based effluent limits and a summary of data submitted to the division as required by Regulation #85. In addition, the division has summarized and analyzed the data submitted as part of Regulation #85 and the results of the effort are included in this report.

2.1 Specific Limitations for Discharges of Nutrients

Regulation #85 establishes technology-based treatment requirements for large domestic and some industrial wastewater dischargers as detailed in Table 3.

Table 3 Regulation #85-Nutrient Effluent Limits for Existing and New facilities

Parameter	Annual Median(1)	95th Percentile(2)
Existing Facilities		
Total Phosphorus	1.0 mg/L	2.5 mg/L
Total Inorganic Nitrogen(3) as N	15 mg/L	20 mg/L
New Facilities		
Total Phosphorus	0.7 mg/L	1.75 mg/L
Total Inorganic Nitrogen(3) as N	7 mg/L	14 mg/L

(1)Running annual median of all samples taken in the most recent 12 calendar months.
(2)The 95th percentile of all samples taken in the most recent 12 calendar months.
(3)Determined as the sum of nitrate as N, nitrate as N, and ammonia as N.

2.1.1 Domestic Wastewater Treatment Facilities

The division actively tracks the progress of the domestic wastewater treatment works (DWWTW) that must comply with the technology-based effluent limits established in Regulation #85 through receiving applications for and processing nutrient grants, preliminary effluent limitations, site location approvals, design reviews, and permits.

Permit Actions: Of the 45 DWWTWs currently subject to the Regulation #85 effluent limits, the division has implemented the applicable requirements in 14 permits that authorize discharges of nutrients. Of those, three met the dilution exception[1] and the division did not apply effluent limits. Eleven received Regulation #85 effluent limits in their permits. Of the 11 that had effluent limits applied, one facility received limits applicable to new facilities, seven received effluent limits applicable to existing facilities, and three received alternate effluent limits based on dilution. Of the 11 that had effluent limits applied, eight were granted compliance schedules for nitrogen and all 11 were granted compliance schedules for phosphorus. The facilities granted compliance schedules are expected to modify their

[1] "Dilution exception" means that the low flow in the receiving water provided enough dilution flow so that the calculated mixed concentration in the receiving stream would continue to meet the relevant interim numeric values in Regulation #31.

treatment or operations in a manner that would trigger the requirement to apply for site approval or design review.

Planning: More facilities are actively planning, designing, and implementing nutrient related projects. To date, 33 DWWTW are working with the division on planning, designing and implementing nutrient related projects. Of the 33, 25 of the DWWTW are subject to the nutrient effluent limitations, most of which have not yet had the effluent limits implemented in their discharge permit. The other eight DWWTW appear to be forecasting a future need to comply with nutrient limits or are aware of the advantages associated with BNR such as dissolved oxygen and alkalinity recovery through biological processes instead of mechanical and chemical processes. Overall, the nutrient grants program appears to have encouraged responsiveness from DWWTW. Twenty of the 25 DWWTW required to comply with Regulation #85 received funding through the nutrient grant program.

Active Projects: The active projects fall within four categories: pilot/study, new facility, scrape-and-rebuild, and upgrade and repurpose (phased or complete). Pilot and study projects account for 11 of the projects and generally focus on biological phosphorus treatment, enhanced dewatering due to biological phosphorus treatment, enhanced settling and phosphorus precipitation, alternate carbon sources, and deammonification. Although three new facilities have requested and received Preliminary Effluent Limits (PEL), only one has received nutrient limits that require treatment. For the other two facilities, dilution raised the nutrient limits above any expected influent loading and nutrient treatment was not required. These two facilities are not included in the total counts. Five plans for scrape-and-rebuilds were submitted. Scrape-and-rebuilds are associated with existing treatment systems that could not be easily modified to provide nutrient treatment. One example is a lagoon treatment system that will be replaced with a mechanical plant. All other applications are associated with upgrades and repurposing of existing treatment infrastructure. These projects appear to be associated with phased construction and often take advantage of infrastructure not currently being used or not used effectively.

Selection of Treatment Technologies: DWWTW appear to be selecting a nutrient compliance strategy by weighing the relative risks, costs, and needs. Risk considerations appear to be centered on the potential implementation of Regulation #31 standards in 2022, the ability and need for future upgrades, and the loss of existing design or permitted capacity by repurposing existing treatment processes to meet nutrient limits. Cost issues appear to be focused on ability to pay, impact to rate payers, and project phasing considerations. Need is related to the conditions of the existing DWWTW current capabilities and flexibility to implement improvements. For example, existing lagoon treatment facilities likely need to convert to mechanical treatment to meet the technology-based nutrient limits while existing mechanical facilities may have other retrofit options. One thread common through all projects is the optimization of existing treatment and the use of improved monitoring and control systems.

DWWTWs have expressed concern as to whether the commission will implement Regulation #31 nutrient standards in 2022. Those DWWTW that have a low risk tolerance appear to be selecting projects that are compatible with future improvements to reach nutrient standards

well below the technology-based effluent limits. These projects are generally more expensive and relate to significant capital construction projects. Other DWWTWs are focusing on the current technology based nutrient limits as the goal. These DWWTWs appear to have a higher risk tolerance or are implementing a long-term phased approach and have chosen to incrementally implement optimization, repurposing of existing infrastructure, or minor capital construction projects. Finally, facilities that need to upgrade from less sophisticated treatment systems to meet technology-based nutrient limits have selected more significant capital construction projects related to the installation of BNR treatment systems that have the flexibility for expansion or modification based on the potential for implementation of the Regulation #31 standards.

While the division has attempted to track nutrient project costs and associate these capital investments with nutrient reductions or gallons treated, no clear conclusions have been reached. Developing conclusions has proved difficult due to the following items:

- Economic climate.
- Variable nutrient treatment gains.
- Incorporating other unrelated projects.
- Rethinking existing treatment processes.
- Phasing of work.
- Incomplete capital cost data set.

Costs: Capital costs vary based on the target nutrient reduction or the selected solution. Different treatment systems have different goal reductions based on influent loading, current capabilities, and effluent targets due to dilution. Furthermore, individual projects may have intermediate phased capital projects that result in incremental improvements. Or, entities may decide that a scrape and rebuild better suits their desires instead of piecing together a string of phased improvements. The cost of construction varies by economies of scale and the current economic climate at the time of bidding. In many cases, capital projects often incorporate other non-nutrient related improvements. These improvements are difficult for the division to dissect from the total cost of the project and distort the nutrient costs especially since the division does not have a complete costs data set. The division does not have the authority to require systems to provide engineer's opinions of probable costs or bid pricing under most circumstances. Often, the division does not have data or only has rough cost estimates as a basis for project comparison. While the current approach toward finding an association between capital cost and nutrient reduction has been unsuccessful, the division is continuing to search for other relationships.

Overall, while a significant number of DWWTW are actively working with the division on nutrient treatment projects, most projects remain unfinished or not fully implemented. The results of the improvements or optimizations cannot yet be determined.

2.1.2 Status of Nutrient Grants and Loans

By the authority granted in House Bill 13-1191, the division was able to provide grant funding to bolster compliance efforts of the domestic facilities required to comply with phase one

nutrient control requirements. The program targeted facilities who are rated as 2 mgd or greater in capacity and located in priority watersheds. The program provided $15 million in funding in state fiscal year 2013-14 and an additional $2 million in state fiscal year 2014-15. Funding reached all corners of the state, touching communities from Durango to Pueblo, and Grand Junction to Fort Collins.

The funding objectives included supporting Regulation #85 compliance and reducing phosphorus and nitrogen in waterways to improve Colorado water quality. The resulting grant project scopes included planning activities and process modifications, as well as treatment improvement design and construction. Examples of planning projects included pilot studies and plant optimization research, the development of watershed management plans, and nutrient engineering reports. As shown in Figure 1, approximately 70 percent of the grants supported construction activities, 22 percent funded design, and the remaining 8 percent was dedicated to planning efforts. The specific awards typically ranged from $80,000 to $1,000,000.

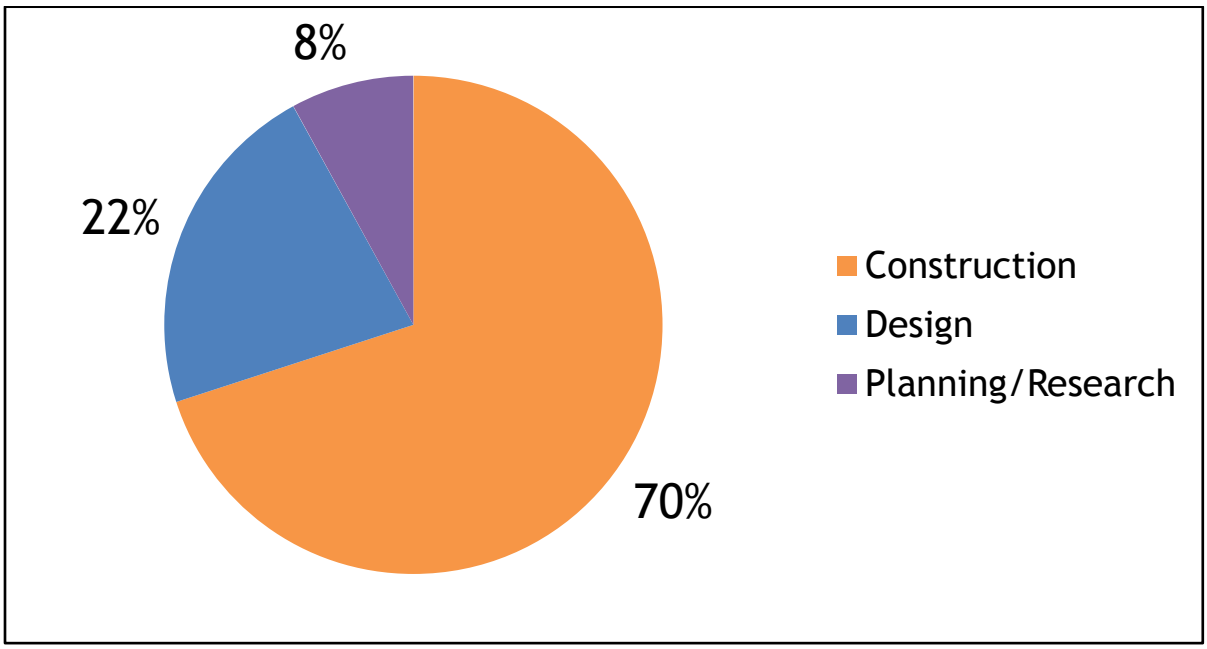

Figure 1 Nutrient Grant Funded Activities

Following are a select set of nutrient grant project highlights:

- ***City of Boulder:*** Boulder's project incorporates pilot studies, including an investigation of brewery waste as a carbon source, treatment optimization, a nutrient engineering report, a process design report, improvement drawings and specifications, and the construction of nitrogen removal upgrades.
- ***Eagle River Water and Sanitation District:*** The District's project includes stream modeling and analysis, watershed research, a nutrient management plan, design and

construction of plant modifications at Avon, and storage nitrification denitrification reactor design and construction at the Edwards plant.

- ***South Adams County:*** South Adams County used their grant in conjunction with a State Revolving Fund loan for the design and construction of their BNR upgrades including a new grit building, ultra-violet disinfection, and new deeper clarifiers at a total cost of $23,191,850.40.

Current Status: To date, the program has funded 20 entities for a total of $16.7 million and awardees have expended $8.9 million representing an approximate 53 percent expenditure rate. Three nutrient projects have been completed. In addition to these accomplishments, the program served to propel many entities forward in a proactive response to altering processes and facilities to meet their pending more stringent permit requirements. All funds have to be expended no later than May 31, 2016.

2.1.3 Non-Domestic Wastewater Treatment Facilities

A total of seven industrial discharges have been identified as currently subject to Regulation #85 effluent limits. Of those, six discharge wastewater associated with the manufacturing of food and kindred products (Standard Industrial Classification (SIC) Major Group 20) and one is an industrial discharger who manufacturers photographic equipment and supplies (SIC 3861) that has been identified as a significant contributor of nutrients. The nutrient control requirements have been implemented in the discharge permit for the manufacturer of photographic equipment and supplies. A compliance schedule was granted in this case. The SIC 20 dischargers' permits have not yet been renewed implementing Regulation 85 effluent limits.

The non-domestic discharges that are subject to Regulation #85 limits, were not eligible for nutrient grants and are not required applying for approval through the site location and designing approval process. The division does not have a mechanism to track planning and improvements to these facilities and has not included these facilities in this analysis.

2.1.4 Status of Nutrient Removal Technology

The commission adopted nutrient effluent limits for both domestic and non-domestic facilities based on the capabilities of three-stage BNR facilities and four or more-stage enhanced biological nutrient removal (eBNR) facilities. The effluent limits that apply to existing facilities were based on BNR, and the effluent limits that apply to new facilities were based on eBNR. In a parallel effort, a stakeholder group worked with the division to update the Design Criteria for Domestic Wastewater Treatment Works policy. The simultaneous efforts enabled the policy stakeholder group to include the most updated design criteria for BNR and eBNR technologies in support of the Regulation #85 decisions. The recent update has prevented significant efforts to update the design criteria policy with alternative technologies not defined within the design criteria policy. While most DWWTW to date have chosen to rely on existing BNR and eBNR technologies to comply with Regulation #85, domestic wastewater treatment works have also used optimization, innovation, and alternative technologies to address the requirements.

Optimization: While optimization is not a technology by itself, Regulation #85 has encouraged a stronger movement toward improved process control to make better use of existing unit processes. Many domestic wastewater treatment works are investing in process improvements in lieu of or as a stopgap for capital construction. Optimization drives the better use of technologies such as oxidation reduction potential, nitrogen, and dissolved oxygen sensors in addition to inspiring innovation.

Innovation: Need often brings about innovation. Regulation #85 has created this need and domestic wastewater treatment works are responding. Many domestic wastewater treatment works are finding ways to comply with the requirements of Regulation #85 by modifying how the existing treatment processes are operated or by repurposing existing unit processes to do more than originally intended. Some of this innovation requires capital improvements and some relies only on rethinking the existing. While innovation is not a technology by itself, innovation drives technologies to new or other levels.

Alternative Technology: Finally, Regulation #85 has motivated vendors, manufacturer, and domestic wastewater treatment works to consider alternative technologies and to work with the division to bring them into Colorado. In a policy sense, alternative technologies are processes or equipment that do not have a current standing within the state, are not accepted, and do not have written design criteria. To be reviewed for acceptance, the manufacturer or vendor must provide sufficient evidence that demonstrates the capability of the technology under Colorado-specific operating conditions and limitations. Based on review of this information, the division has the option to authorize the technology for use in Colorado and develop design criteria. This process is intended to protect water quality by only accepting proven technologies. Colorado is not a proving ground for untested technologies but is open to expanding the options available for consideration by DWWTWs. Since the adoption of Regulation #85, the division has received an increased number of alternative technology applications for nutrient related treatment processes and equipment including technologies related to facilities less than 1 mgd and lagoons. Examples of recent alternative technology acceptances for nutrients include: deammonification, ballasted clarification, and biological fixed film technologies.

Based on the current activities within the wastewater industry worldwide, the division expects that optimization, innovation, and alternative technology advancements will continue to progress in the coming years.

2.1.5 Status of Additional Provisions Applicable to Treatment Facilities

Regulation #85 contains a few additional provisions for treatment facilities at 85.5(3). These include the direction to the division regarding compliance schedules, criteria for exemptions from effluent limits (discussed above), provisions for obtaining variances from effluent limits, and provisions for trading.

Compliance Schedules: The division made modifications to its Permit Compliance Schedules Implementation Policy in March 2014, and incorporated the specific provisions adopted in Regulation #85 that pertain to the development of a compliance schedule including its

duration and milestones. Because those provisions were found to be consistent with the division's current practice, no additional text was needed to interpret those requirements or to make other sections of the policy conform to these new regulatory provisions.

The division has included compliance schedules in permits as appropriate. A summary of the number of permits in which compliance schedules have been included is discussed in section 2.1.1 above.

Variances: Where there is a demonstration that the nutrient reduction benefits of meeting the section 85.5 effluent limitations do not bear a reasonable relationship to the economic, environmental or energy impact resulting from meeting those effluent limitations, the division may grant a variance. To date, no permittee has requested a variance under Regulation #85.

Trading: No permittee has requested a trade under Regulation #85. The division met with one permittee to discuss trading during 2014 and that entity expressed interest in a point source-to-point source trade. However, the trading scheme discussed was similar to the trades that permittees conduct as part of Colorado's Reservoir Control Regulations, which focus on trades that provide a net water quality benefit in the control regulation basin and focus on in-lake protection. Regulation #85's trading provision focused on trades that will result in equal or better instream water quality for a given parameter at all locations and at all times. The Regulation #85 provision is consistent with the division's Colorado Pollutant Trading Policy. Therefore, the trading option described above would not be allowed under Regulation #85.

2.1.6 Status of Municipal Separate Storm Sewer Requirements

Regulation #85 contains requirements for Municipal Separate Storm Sewer System (MS4) permits that will be included at the time of renewal. MS4 permittees will be required to address the following in their stormwater management programs:

- Public education and outreach on stormwater impacts associated with nutrients.
- Pollution prevention/good housekeeping for municipal operations associated with nutrients.

The current draft of one of the division's largest MS4 general permits, the Phase II standard MS4 permit, as well as the draft permit for MS4s that discharge to the Cherry Creek Reservoir Basin, now include nutrient requirements addressing these areas. The division plans to address these nutrient requirements in other MS4 permits as they are renewed.

2.1.7 Status of Nonpoint Source Discharges Implementation

Regulation #85 includes provisions that specify the voluntary management of nonpoint sources of nutrients. The regulation includes a discussion about nonpoint to point source nutrient trading, nonpoint source best management practice (BMP) implementation, nonpoint source public information and education and nonpoint source monitoring. For each of these discussion topics, the division's roles and responsibilities are identified in the regulation,

including the division's responsibility to report during triennial review on progress in implementing the regulation's nonpoint source provisions.

Nonpoint Source Nutrient Pollution BMP Implementation: Regulation #85 requires the division to collaborate with owners and operators of agricultural operations in pursuing incentive, grant and cooperative programs to control nonpoint source pollution related to agricultural and silvicultural practices. Since promulgation of Regulation #85, the division's nonpoint source program focused its efforts on nutrient management BMPs in the agricultural sector.

The division's nonpoint source and water quality planning programs are currently collaborating on nutrient management BMP implementation projects utilizing Colorado Water Resources and Power Development Authority and Clean Water Act Sections 319 and 604(b) funds.

The division's nonpoint source and water quality planning programs are providing $83,000 to Colorado State University (CSU) through its Center for Comprehensive, Optimal and Effective Abatement of Nutrients (CLEAN Center) for development of a watershed assessment tool. This is part of a suite of analytical tools the division is working with the CLEAN Center to develop in support of Regulation #85 implementation. The watershed assessment tool will assist the division and stakeholders in characterizing nutrient pollution sources within the watersheds identified by the statewide nutrient model also under development by the CLEAN Center and the tool will be used by the nonpoint source and water quality planning programs to help meet a number of other planning and implementation needs. The watershed assessment tool is expected to be completed in early 2016 and will be available at www.erams/com/cdphe.

In order to better catalog agricultural nutrient management BMPs, the division's nonpoint source program contracted with CSU Extension on a project called the South Platte Agricultural Nutrients (SPAN) Project. The SPAN Project, funded at $219,000, engages agricultural producers in the South Platte basin to assist in developing a database of agricultural nutrient management BMPs. The database will be housed in the CSU Environmental Risk Assessment and Management System (eRAMS) platform and will be available at www.erams.com/cdphe in early 2017. This database will complement another BMP database being developed independent of division resources by Wright Water Engineers.

The division's nonpoint source program is also working with the Natural Resources Conservation Service (NRCS), an agency within the United States Department of Agriculture, to obtain statewide information about nutrient management BMP implementation. Many of these BMPs in Colorado and nationwide are implemented through voluntary programs administered by the NRCS; however, due to privacy concerns with NRCS data and individual agricultural producers, the nutrient management BMP data is not readily available. The division and NRCS are in the process of executing a memorandum of understanding, which will allow the division to obtain the nutrient management BMP data directly from NRCS while still protecting the producers' privacy.

Nonpoint Source Public Information and Education: Regulation #85 encourages the division, in collaboration with others, to develop and implement a nonpoint source nutrient

management public information and education program. The program should focus on prevention of nonpoint source nutrient pollution from current and future activities and reduction of known nonpoint sources of nutrient pollution. The program should also be consistent with a voluntary, incentive-based approach and focus on the general public and agricultural and local government sectors.

The division contracted with CSU Extension to create an educational outreach program about agricultural nutrient management BMP implementation. The contract, which is for $200,000, will be fully executed by December 2016. The communication program will likely include videos, brochures, and speaking material for a speaker's bureau about nutrient pollution and agriculture.

In addition to the CSU Extension contract for outreach to the agricultural community, the nonpoint source program communicated the role of Regulation #85 to the program's stakeholders through the program's website, the program's day-to-day interaction with stakeholders, and watershed conferences and other nonpoint source organized events.

The division also continued to coordinate with numerous other stakeholder groups interested in nutrient pollution management. Division staff participated in the CLEAN Center annual meeting in February 2015 and continued coordination with the center in monthly meetings. The division staff participated in the Colorado Monitoring Framework's Agricultural Alliance and the "Ag Thinking Group" initiated by Brown and Caldwell.

Finally, the division's nonpoint source program continued its dialogue with the United States Environmental Protection Agency (EPA) and NRCS as part of the national nonpoint source program priority to better coordinate funding and actions related to nutrients management. In addition to its on-going efforts to assist NRCS with the National Water Quality Initiative, a NRCS program that provides financial assistance to implement BMPs for the reduction of nitrogen, phosphorus, sediment and pathogens from agricultural lands in watersheds where water quality is a concern, the nonpoint source program proactively worked with EPA Region 8 and NRCS to better understand all NRCS nutrient management programs and how to utilize NRCS resources within the state to help reduce nutrient pollution.

2.2 Monitoring Requirements

The commission included monitoring nutrient conditions as an important component of a statewide nutrient pollution control strategy and included monitoring requirements in the Regulation #85. This comprehensive data collection and the subsequent assessment efforts are intended to support future decision-making. The focus of the requirement of the Regulation #85 is to gather data that can be assessed to inform an analysis of the effectiveness of the regulation, to support quantification of sources and support development of requirements for additional source controls shown to be necessary.

2.2.1 Monitoring by Process Wastewater Discharges

Identified Colorado Discharge Permit System (CDPS) permitted facilities that discharge nutrients were required to commence sampling on March 1, 2013. This includes all DWWTW as

well as any non-domestic dischargers in SIC Major Code 20 facilities. In all, close to 390 facilities are required to collect and submit nutrient data to the division. Data collection was also required for discharges from cooling towers (discussed in Section 2.3.5).

The nutrient monitoring program requires that facilities develop, implement and document routine water quality monitoring. All facilities are required to monitor effluent quality and flow. Facilities with a design capacity of over 1 mgd are required to also conduct stream nutrient monitoring. Data is submitted to the division annually on or before April 15th.

Figure 2 highlights all facilities that are required to submit data. Effluent monitoring sites are represented by triangles, with green indicating the facility has submitted data to the division while yellow indicates facilities that have not yet submitted data. Instream monitoring locations are denoted by purple circles for sites located upstream of facilities, while sites located downstream are shown with blue pentagons. Some instream monitoring locations are considered auxiliary, and are denoted by pink squares.

To date the division has received data for ten months in 2013 and twelve months in 2014 as summarized in Table 3.

Table 3 Summary of Data Submission[1] for 2013 and 2014

Design Capacity Group (mgd)	2013 Data		2014 Data		
	# of facilities	# data points[2]	# of facilities	# data points	total data points
≤ 1	181	895	208	1,246	2,141
> 1 and ≤ 2	15	188	25	295	483
> 2	51	695	65	833	1,528
Total received	247	1,778	298	2,374	4,152

[1]Numbers represent total phosphorus data.
[2]Number of data points represents both effluent and instream data.

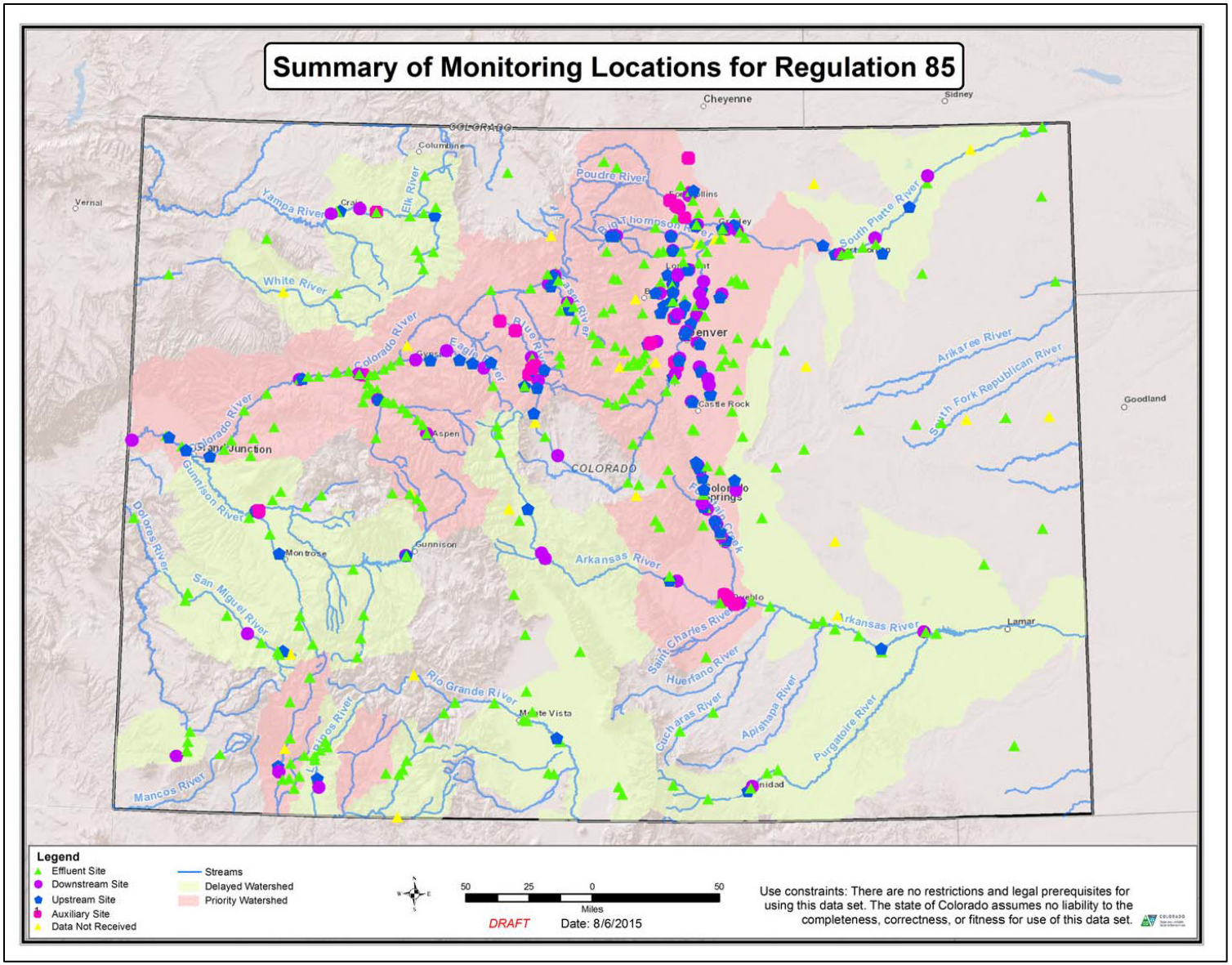

Figure 2 Location of Regulation #85 Nutrient Monitoring Stations throughout Colorado

2013 Data Submittal: In 2013, data was received from over 240 facilities. Facilities missed the reporting requirement for a variety of reasons. Some did not believe that the monitoring requirements applied to their facility as they were exempt from permit limits. Others had zero discharge and therefore did not submit a report.

The division required that the 2013 data be submitted through a standard template, which proved to be challenging for many dischargers. Even though outreach was provided to most of the facilities, the process of tracking, validating and checking the data reports received took over 6 months. This time includes a month used to validate data submitted through the Colorado Data Sharing Network (CDSN). CDSN submitted reports for over 20 facilities in one batch.

2014 Data Submittal: In preparation for the 2014 data submittal, the division developed a user-friendly form to improve the report submittal process. The division conducted public outreach and education while developing the new form, including a series of webinars for facilities, outreach to labs who were conducting the analyses as well as one on one coaching to roughly 90 percent of all facilities with monitoring requirements. As a result of both the new form and the outreach provided over the previous year, the division was able to check the data for completeness the 2014 data in one month as compared to six months from the previous year.

Preliminary Evaluation – Data sufficiency: The monitoring program is intended to provide adequate data to calculate total nitrogen, total inorganic nitrogen and total phosphorus load in the effluent for all facilities and to be able to begin to quantify total loads and sources to Colorado's waters. Of the approximately 390 facilities required to collect effluent data, 96 have a design capacity of greater than 1 mgd and are required to collect stream nutrient data necessary to calculate total nitrogen and total phosphorus loads downstream of the facility and total nitrogen and total phosphorus concentration above the facility.

The division's preliminary evaluation of the locations, parameters and frequency of sampling is that the current requirements are adequate to support the intended future decision-making and characterization of ambient conditions across the state as well as a characterization of current effluent quality. The collection of both effluent and ambient conditions is fundamental in determining the effectiveness of the control regulation. The parameters chosen are appropriate as they offer information to not only assess the effluent limits as outlined in Regulation #85 but also to assess the interim values in Regulation #31.

Baseline Nutrient Conditions: One objective of the data collection is to characterize the current nutrient condition, or baseline conditions, before Regulation #85 nutrient reductions are fully implemented. The division is evaluating the amount of data needed to make this determination. This is further discussed below in Section 2.3.6.

Division Generated Data: To supplement the permittee data collection effort, the division has expanded its monitoring program to fill gaps that have been identified in the instream network of locations. This work has focused on the division's trend monitoring program and on

selecting additional monitoring locations for state fiscal year 15-16. The division will reevaluate this additional monitoring every year to best supplement the data collection from Regulation #85. The additional monitoring stations are shown in Figure 3. The division is supplementing in stream nutrient data by monitoring nutrients at its trend sites, shown as black triangles and additional 2016 sampling locations, shown in green hexagons with black dots. Other sites are as described for Figure 2.

2.2.2 Data Collection by Municipal Separate Storm Sewer Dischargers

Regulation #85 includes a reporting requirement for cities, towns, counties, and city and counties that had MS4 CDPS permits before March 1, 2012. Non-standard MS4 permittees (e.g., special districts, school districts, universities, etc.) are not included in this requirement. The standard, pre-existing MS4s permittees were required to submit a Discharge Assessment Data Report by October 31, 2014. The purpose of this requirement is to identify representative available information and necessary additional information (the “gap”) that in combination can be used to characterize the contribution of nutrients from the MS4 discharge to state waters. This initial requirement was focused on understanding the contribution from MS4 discharges on a broader basis instead of for specific outfalls.

The division received two Discharge Assessment Data Reports. One report was submitted by the City of Boulder and the second was submitted as a collaborative report by the Urban Drainage and Flood Control District and the Colorado Stormwater Council (identified as "the collaborative report" in this document). The collaborative report was submitted on behalf of all of the MS4 permittees in Colorado subject to the reporting requirements with the exception of the City of Boulder.

Non-standard MS4 permittees were encouraged to consider voluntary participation in the data collection efforts. The collaborative report did include data for discharges from non-standard MS4s.

MS4s Discharge Assessment Data Reports included a review of national and Colorado data to provide the required information. Both reports concluded that using Event Mean Concentration for specific land uses provides the best representative estimates for nutrient concentrations in discharges from MS4s. The division agrees that this approach is appropriate. Results are discussed below at section 2.3.4.

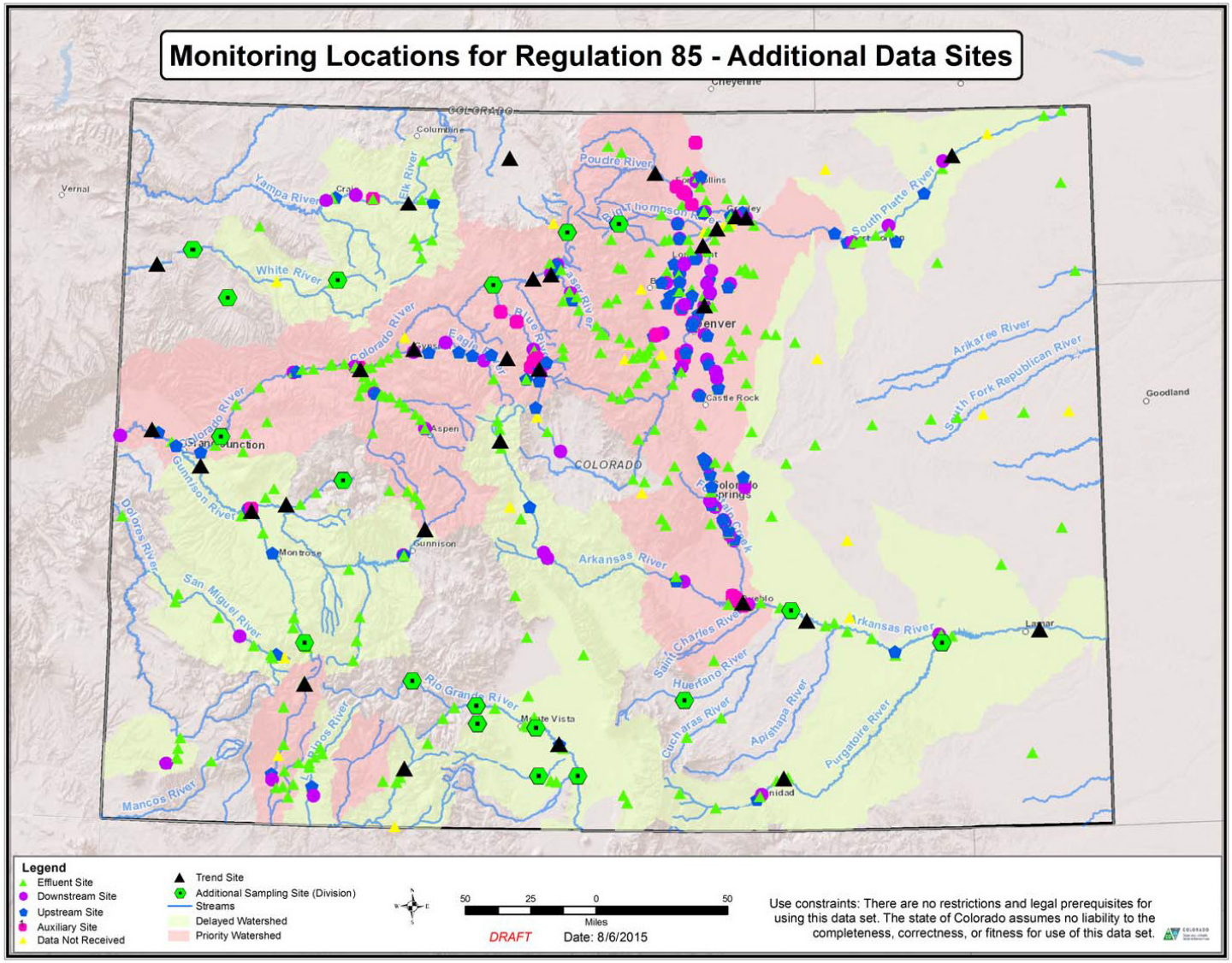

Figure 3 Location of Regulation #85 nutrient monitoring stations added by the division

2.2.3 Monitoring by Cooling Towers

At the time of the rulemaking hearing, there were questions about the relative extent of nutrient contributions from facilities with cooling towers. There was not enough information to determine whether or not the chemical use (e.g., to prevent scale formation in a cooling tower) resulted in significant contributions of nutrients. As a result, the commission included a two-year monitoring requirement for cooling tower effluent to determine whether nutrient controls should be required the in future.

Monitoring of the inflow, discharge, and any nutrient in added chemicals was required beginning November 1, 2012 and continued for a period of 24 months through October 31, 2014. A report summarizing all analytical results was required to be submitted by February 28, 2015. Approximately 40 facilities were included in the cooling tower monitoring requirement. The division received data from 80 percent of the facilities with cooling towers.

The division's initial review of the cooling tower reports concluded that the nutrient contributions from these systems are highly variable and that generalizations about "all cooling towers" are not possible at this time. Some of the variability is due to inconsistency in the way data was collected and submitted. Despite the inconsistencies, the division believes it can utilize what was submitted and no further sampling should be required. The division will have to contact individual facilities to obtain missing data and clarify information on the operational aspects such as chemical use, days of operation, and process specifics. A supplemental survey or informal discussion may be required.

2.2.4 Review of Data Quality Requirements

Regulation #85 outlines data quality requirements in Section 85.6(4). The two basic requirements in 85.6(4) include the development of a Sampling and Analysis Plan (SAP) by each facility collecting data and the use of sufficiently sensitive test methods. Permittees were required to submit a certification to the division confirming that the SAP was in place and that monitoring began by March 1, 2013. The division has received SAP Certifications for 96% of the facilities required to monitor. The requirement to develop a SAP has encouraged permittees to develop a strong monitoring program that includes a focus on methods, quality control and the appropriate selection of sampling locations.

The regulation also requires permittees have samples analyzed using methods specified in 40 C.F.R. Part 136 or as otherwise approved by the division. Full compliance with this measure will ensure that the data is of sufficient precision so that it can be used in subsequent analyses. Overall, the data quality requirements have been successful in assuring that the data collection is done in a consistent manner.

2.2.5 Reporting, Processing and Availability of Data

It was the commission's intent that the data collected under this control regulation be publically available in a form that is easily accessible for public evaluation. The process to meet that intent has been challenging for both the permittees and the division.

The division received nutrient data from 247 facilities from 2013 and 298 facilities from 2014 in electronic form. Once data was examined, checked and completed, it is uploaded into the division's local database, Environmental Quality Information System (EQuIS). From EQuIS, the data is transferred EPA's storage and retrieval data warehouse, STORET. From this location, the public can access the data. The data was also transferred to eRAMs, where it is available on CSU's website through a statewide (and national) assessment effort of nutrients. The eRAMS Regulation #85 data analysis tool was developed to look at loading across the state using the data collected through the monitoring requirements in Regulation #85.

2.2.7 Nonpoint Sources and Unpermitted Point Sources Data and Information

Nonpoint Source Nutrient Pollution Analysis: The division will be conducting an analysis of nonpoint sources of nutrient pollution using the statewide nutrient model that is currently being built by the CLEAN Center. This analysis is expected to occur during the first half of 2016.

Atmospheric Nitrogen Deposition: The United States Geological Survey and other agencies have estimated that the deposition of atmospheric nitrogen may be a significant source of nitrogen loading to surface water in Colorado. The estimates range between 10 to 30 percent of the total nitrogen load in surface water being contributed by atmospheric deposition.

The Colorado Department of Public Health and Environment (CDPHE) has collaborated with other agencies to determine actual wet and dry nitrogen deposition rates in Rocky Mountain National Park. However, the applicability of this data for the entire state is questionable. Air quality professionals within CDPHE recommend the use of the National Atmospheric Deposition Program's (NADP) data to understand the contribution of atmospheric nitrogen to state waters. The NADP has developed a hybrid-approach model that is based on their measurement network and includes a treatment of atmospheric concentrations and deposition velocities (measured values are given more weight at the monitor locations, while modeled data are used to fill in spatial gaps and provide information on chemical species that are not measured by the routine monitoring networks). This model considers both dry and wet deposition (i.e. total deposition) and it provides continuous spatial and temporal coverage of total deposition estimate in the U.S. with a 12 km resolution for all of the nitrogen parameters that we're interested in for Regulation #85. This data will be used in the statewide nutrient model being developed by CSU to better understand the atmospheric contribution, particularly to headwaters where interim values have been adopted as standards.

2.2.6 Division's Compliance and Enforcement Response Strategy

The division has provided Regulation #85 compliance assistance during the normal course of conducting Comprehensive Evaluation Inspections. This entailed covering the need for a SAP as well as the associated nutrient monitoring when reviewing permit and control regulation requirements during an inspection. During the 2013-14 inspection year this included 98 DWWTW, while during the 2014-15 inspection year it included 91 DWWTW. Similar compliance assistance is ongoing for the current inspection year, with inspections planned for 138 DWWTW. Additionally, the division occasionally conducts operator training sessions, and has

completed four training such trainings specifically addressing Regulation #85 requirements. Additionally, during other operator training sessions, training time was devoted to explaining Regulation #85 requirements, even though the focus of the training was not specific to Regulation #85.

In July 2013, compliance advisory letters were sent to over 100 DWWTWs because they failed to submit the required certification to indicate that they have developed and were implementing a SAP for nutrient monitoring. The requirement was to submit the SAP Certifications by March 31, 2013. To mitigate the violation, the division encouraged that the DWWTW submit the certifications. This resulted in a 97 percent compliance rate.

In September 2014, compliance reminders were sent to approximately 120 DWWTW because they failed to submit the required nutrient monitoring data by April 15, 2014. DWWTW were strongly encouraged to submit the nutrient monitoring data for the facility as soon as possible or provide a written explanation of the cause of noncompliance, including an explanation of how it will be prevented in the future.

2.3 Regulation #85 Data Analysis and Summary

The division has begun to assess the data and information that has been submitted in response to requirements in Regulation #85. The data assessment efforts to date are focused on the assessment of process wastewater effluent of total phosphorus and total inorganic nitrogen and the assessment of stream nutrient quality of total phosphorus and total nitrogen.

2.3.1 Assessment of Process Wastewater Effluent

Data are available to estimate annual median total phosphorus and total inorganic nitrogen effluent quality for the 54 facilities that are subject to Regulation #85 effluent limits. Figures 4 and 5 show how current effluent quality of those facilities compare to the effluent limits outlined in Regulation #85.

Total Phosphorus: Figure 4 shows annual median total phosphorus discharge concentrations for each facility subject to effluent limits in the various Colorado basins. Red horizontal lines indicate the discharge limit for existing (solid) and new (dashed) facilities. Median values were determined for each facility for calendar year 2014. For all facilities required to submit nutrient data, 16.5 percent are meeting the median total phosphorus effluent limit for existing facilities. This is true, regardless of the size of the facility as 20 percent of the larger facilities are currently meeting the limit for existing facilities. This is expected as the majority of facilities have not begun to implement improvements at their facilities to meet Regulation #85 requirements.

Total Inorganic Nitrogen: Figure 5 summarizes the annual median total inorganic nitrogen discharge concentrations for each facility subject to effluent limits in the various Colorado basins. Red horizontal lines indicate the discharge limit for existing (solid) and new (dashed) facilities. Median values were determined for each facility for calendar year 2014. For all facilities required to submit nutrient data, the general observation is that 57 percent of the facilities can currently meet the total inorganic nitrogen limits for existing facility. For larger

facilities that are currently subject to effluent limits, nearly 78 percent can currently meet the limits for total inorganic nitrogen. Many facilities across the state have implemented controls to address ammonia and these improvements may be part of the reason why facilities are more able to meet the total inorganic nitrogen limits.

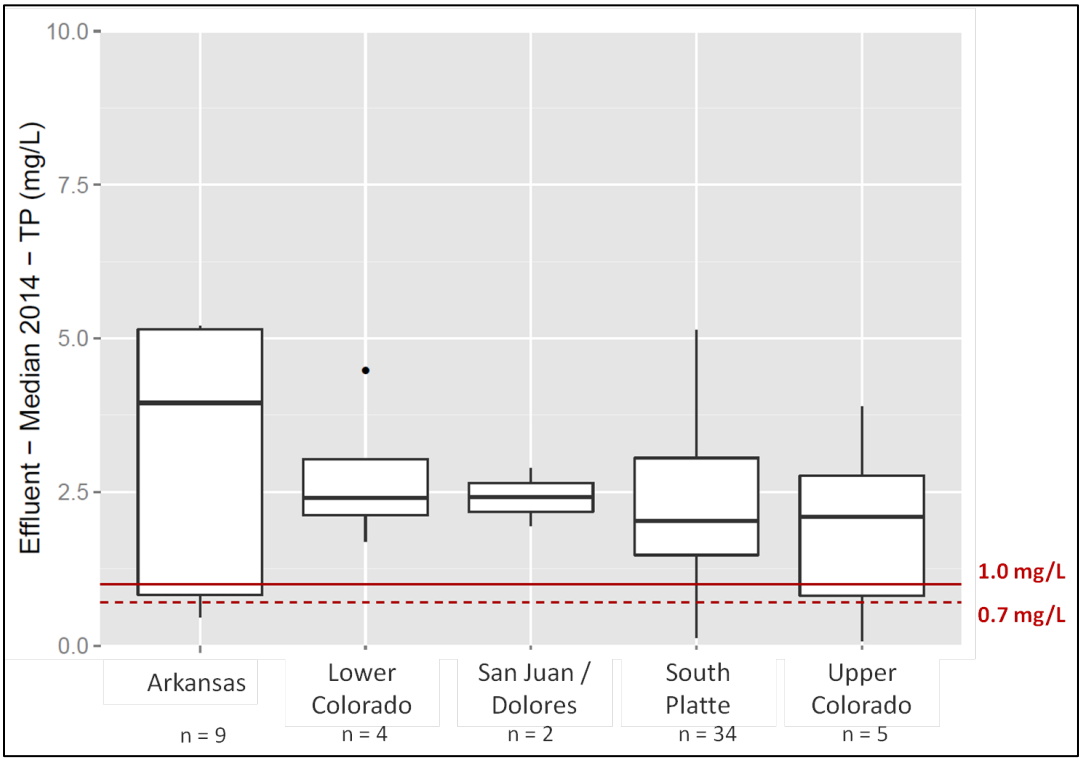

Figure 4 Median Phosphorus Concentrations for Regulation #85 Facilities

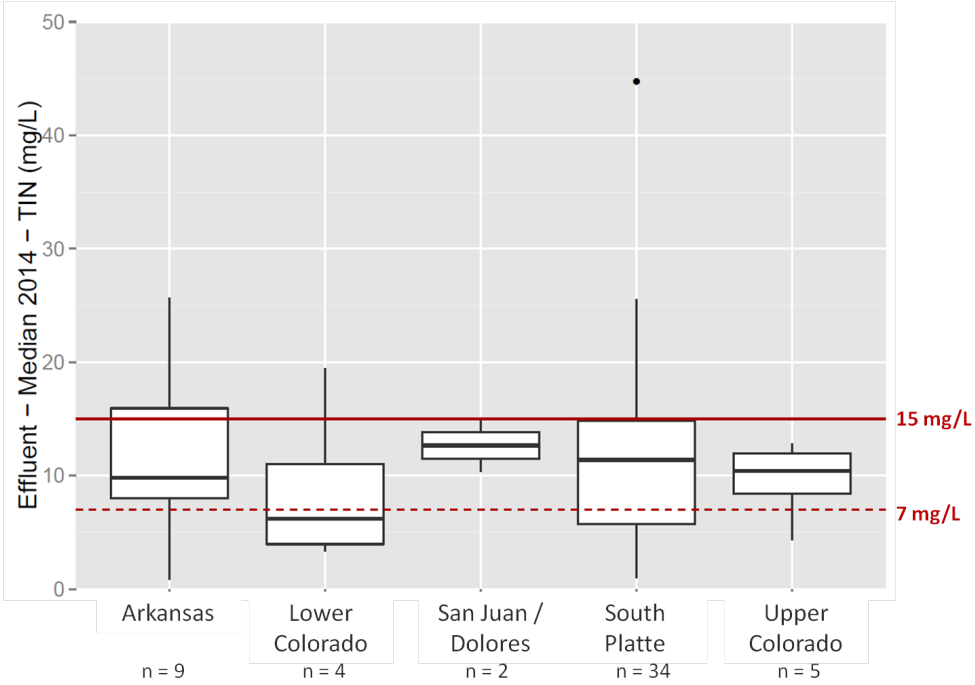

Figure 5 Median Total Inorganic Nitrogen Concentrations Regulation #85 Facilities

2.3.2 Assessment of Stream Nutrient Quality

Of the 390 facilities required to submit nutrient data, approximately 95 are required to submit instream data. The instream monitoring requirement only applies to facilities greater than 1 mgd. The division received instream nutrient data from 88 facilities from 2013 and 89 facilities from 2014 in electronic form.

Figures 6 and 7 illustrate all instream data submitted. This includes all upstream and downstream sampling locations. Data located below dischargers are not subject to Regulation #31 standards at this time. Data is grouped by major basin to take an initial look at how ambient concentrations may vary from basin to basin. Note that scale for the nutrient concentrations is different for each major basin. The warm water interim numeric values are represented by the solid red line. The cold water interim numeric values are represented by the dotted red line. At the time of this analysis the facilities were not grouped by the aquatic life use classification (cold or warm) but as more data is gathered this may be assessed.

For total phosphorus shown in Figure 6, there is a lot of variability in ambient concentrations. Based on these two years of data, it appears that the major basins on the west slope – the Gunnison River, the San Juan River and the Upper and Lower Colorado River basins are lower than in those basins on the east slope – the South Platte River and the Arkansas River basins.

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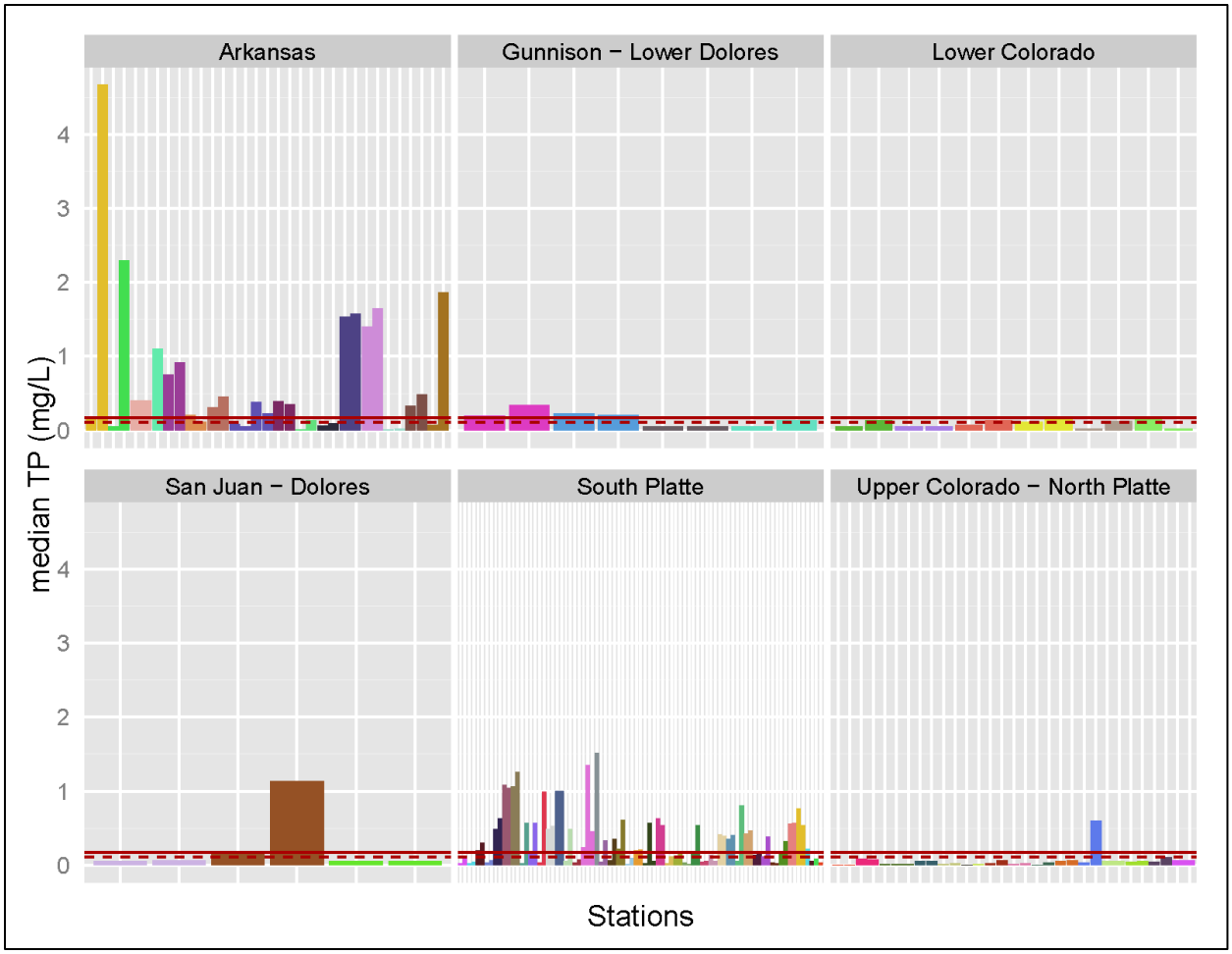

Figure 6 Median Instream Total Phosphorus Concentrations

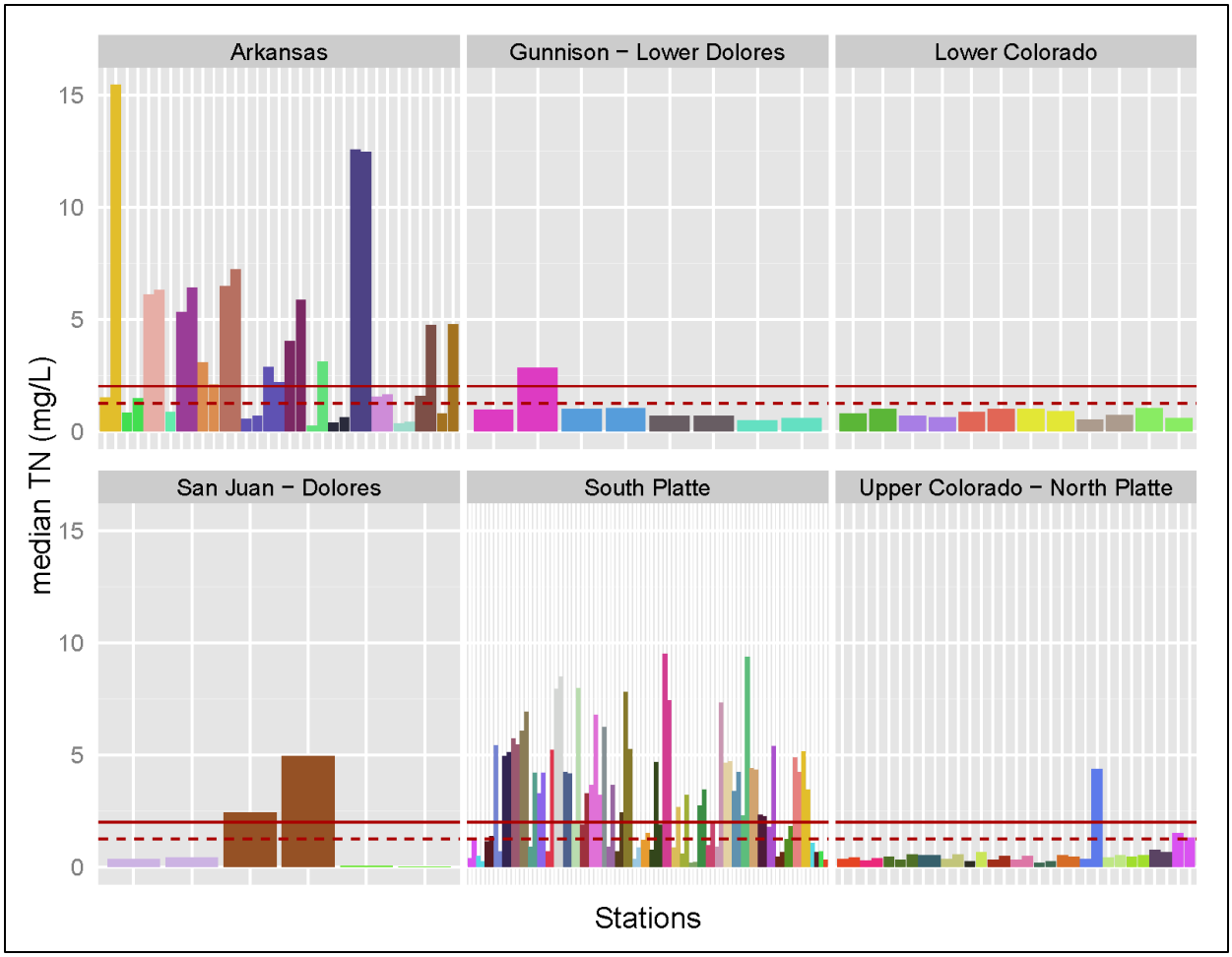

Figure 7 Median Instream Total Nitrogen Concentrations

2.3.3 Evaluation of Priority Watersheds

In the development of Regulation #85, the commission chose an implementation strategy that ensured progress toward nutrient reduction in Colorado through implementation in high priority watersheds first. The commission provided a 10-year delay in application of the effluent limits for facilities smaller than 2 mgd or in low priority watersheds.

Information presented in the 2012 hearing indicated that the most significantly nutrient impacts occur in highly urbanized areas along the Front Range and downstream of the urbanized areas of the west slope. The commission also considered areas with existing high quality water where population centers were predicted to experience significant growth to be a high priority for protection. Implementing the phased approach was expected to result in reductions in nutrient loadings in these areas.

Low priority watersheds were defined by geographic areas with a lower treatment plant capacity per square mile, in areas where there was no significant nutrient impact and population growth was not expected to significantly increase. These low priority watersheds are defined in the regulation in Section 85.5(1)(a)(ii)(C).

The division began to look at nutrient loading as it relates to high and low priority watersheds. These analyses were based on median concentrations at each facility and average effluent flow and provide an approximate estimation with just a few years of data. Additional work will be needed to examine population growth in these areas. Additional work through the Soil and Water Assessment Tool (SWAT) model in eRAMS may also help inform decisions regarding the implementation strategy for Regulation #85 and whether the low priority watersheds as defined are appropriate.

As shown in Tables 4 and 5, the average load for both total phosphorus (Table 4) and total nitrogen (Table 5) is highest for the largest facilities (greater than 2 mgd) and located in a high priority watershed. This confirms why these locations were targeted during the 2012 Regulation #85 rulemaking.

Table 4 Total Phosphorus Loading for Watershed Priority Category and Design Capacity

Design Capacity Group	Percent of Facilities in Design Capacity Group	Average total phosphorus loading (lbs/day) to:		
		High Priority Watersheds	Low Priority Watersheds	Watersheds with No Priority Designation
≤ 1.0 mgd	70%	170	210	50
> 1.0 and ≤ 2.0 mgd	8%	80	90	N/A
> 2.0 mgd	22%	3,100	910	290

Table 5 Total Nitrogen Loading for Watershed Priority Category and Design Capacity

Design Capacity Group	Percent of Facilities in Design Capacity Group	Average total nitrogen loading (lbs/day) to:		
		High Priority Watersheds	Low Priority Watersheds	Watersheds with No Priority Designation
≤ 1.0 mgd	70%	780	540	270
> 1.0 and ≤ 2.0 mgd	8%	450	570	N/A
> 2.0 mgd	22%	21,600	2,500	380

2.3.4 MS4 Information Results

As discussed above (see section 2.2.2), the MS4 permittees concluded that existing information was adequate to characterize the concentrations of nutrients in discharges from their MS4s.

The City of Boulder report concluded that the Event Mean Concentration (EMC) values published in Table 1-2 from the *Urban Storm Drainage Criteria Manual, Volume 3 Best Management Practices*[2] provided representative information for the city's MS4 discharges. These EMC values were based on data from MS4 discharges in the Denver metropolitan area. These values are provided in Table 6, below.

[2] Urban Drainage and Flood Control District, 2010. Urban Storm Drainage Criteria Manual, Volume 3 Best Management Practices.

The collaborative report also evaluated the same EMC values as were used for the City of Boulder report, and also concluded the values provided representative estimates. However, the collaborative report did not identify any one specific source for EMCs or datasets included in the report which would be the most representative, but instead referenced multiple sources that the report found to provide statistically consistent results. The collaborative report identified several variables that could influence EMCs. Table 6, below, provides the EMCs identified in the report as representative ranges for MS4 discharges in Colorado.

Table 6 Representative EMC Values from Discharge Assessment Data Report

Parameter	Collaborative Report Event Mean Concentration, mg/L	City of Boulder Event Mean Concentration, mg/L
Total Phosphorus	0.22 to 0.45	0.40 to 0.65
Total Nitrogen	2.79 to 4.19	2.7 to 3.4

The reports also provide significant discussions and proposals on options for using modeling to estimate flows from MS4 outfalls based on precipitation and land use data. The reports' conclusions that the EMC values provided in the report are representative for discharges from permitted MS4 outfalls means that the values can then be used along with the flow modeling to determine estimates for nutrient loading from MS4 outfalls.

The reports did not identify the presence of any data gaps. It was the reports' conclusions that additional monitoring for purposes of general characterization of nutrient concentrations and loads in MS4 discharges in Colorado in not necessary to meet the Regulation #85 objectives.

2.3.5 Cooling Tower Monitoring Results

The division's initial review of the cooling tower reports concluded that the nutrient contributions from these systems are highly variable and that generalizations about "all cooling towers" are not possible at this time. From initial review, however, it is clear that in roughly half of the facilities that complied with the monitoring and reporting have total phosphorus concentrations in effluent that exceeds 1.0 mg/L as an annual average[3]. This is due to phosphorus-rich chemical additives used to control scaling in cooling towers.

The total inorganic nitrogen concentrations in effluents from most facilities are below 15 mg/L[4], but the results are variable. The division also evaluated the inflow versus outflow from these facilities for both total phosphorus and total inorganic nitrogen. In most cases, as was expected, the concentrations increase from inflow to outflow.

2.3.6 Assessment of Duration of Monitoring Requirement

One objective of the data collection is to establish a baseline before Regulation #85 is fully implemented. The amount of data needed to establish this baseline is a question that should be answered when the regulation is reviewed. At the time of the review in 2017, the data

[3] This is the total phosphorus limit in Regulation No. 85 for existing facilities.
[4] This is the total inorganic limit in Regulation No. 85 for existing facilities.

collection effort will have amounted to four years of data. Over four full years this could amount to over 11,000 data points, per parameter, to characterize effluent quality and approximately 9,000 data points, per parameter, to characterize ambient quality. The number 9,000 data points to characterize ambient quality is likely inflated as groups are coordinating instream data collection and sharing sites where appropriate. There are other considerations that should be made for the determination of adequate data. These include the amount or adequacy of data collected by facility size, amount or adequacy of data collected by treatment type and receiving watershed characteristics.

2.3.7 Preliminary Predictive Analysis

The division intends to conduct a preliminary predictive analysis of the expected nutrient reductions that will occur and potential changes to instream nutrient concentrations when Regulation #85 is fully implemented. The division indicated through the stakeholder process for this triennial review that this analysis may not be complete for the October 2015 informational hearing. The division intends to start the predictive analysis during the first half of 2016 when the statewide nutrient model (SWAT Model), being constructed by the CLEAN Center, is complete.

Section 3
Progress on Implementing Regulation #31

In 2012, the commission adopted interim numerical values for phosphorus, nitrogen, and chlorophyll *a* for (1) rivers and streams and (2) lakes and reservoirs in a new provision in Regulation #31 at 31.17.

Interim Values: The numerical values are based on the maximum amounts of each pollutant that can be present in water and still protect the designated beneficial use. These numerical values can be considered for the adoption of standards for individual water bodies in phases. Adoption of phosphorus and chlorophyll standards during the first phase will protect waters above current dischargers. Adoption of total nitrogen standards is delayed until 2017. The interim values are summarized in Tables 7, 8 and 9 below.

Table 7 Interim Total Phosphorus Values

Lakes and Reservoirs, cold, >25 acres	25 µg/L [(1)]
Lakes and Reservoirs, warm > 25 acres	83 µg/L [(1)]
Lakes and Reservoirs, ≤ 25 acres	RESERVED
Rivers and Streams – cold	110 µg/L [(2)]
Rivers and Streams - warm	170 µg/L [(2)]

[(1)] summer (July 1-September 30) average total phosphorus (µg/L) in the mixed layer of lakes (median of multiple depths), allowable exceedance frequency 1-in-5 years.
[(2)] annual median total phosphorus (µg/L), allowable exceedance frequency 1-in-5 years.

Table 8 Interim Total Nitrogen Values

Lakes and Reservoirs, cold, >25 acres	426 µg/L [(1)]
Lakes and Reservoirs, warm, > 25 acres	910 µg/L [(1)]
Lakes and Reservoirs, ≤ 25 acres	RESERVED
Rivers and Streams – cold	1,250 µg/L [(2)]
Rivers and Streams - warm	2,010 µg/L [(2)]

[(1)] summer (July 1–September 30) average total nitrogen (µg/L) in the mixed layer of lakes (median of multiple depths), allowable exceedance frequency 1-in-5 years.
[(2)] annual median total nitrogen (µg/L), allowable exceedance frequency 1-in-5 years.

Table 9 Interim Chlorophyll *a* Values

Waterbody type		DUWS
Lakes and Reservoirs, cold, >25 acres	8 µg/L [(a)]	5 µg/L[(c)]
Lakes and Reservoirs, warm, > 25 acres	20 µg/L [(a)]	
Lakes and Reservoirs, ≤ 25 acres	RESERVED	
Rivers and Streams – cold	150 mg/m^2 [(b)]	
Rivers and Streams - warm	150 mg/m^2 [(b)]	

[(a)] summer (July 1- September 30) average chlorophyll *a* (µg/L) in the mixed layer of lakes (median of multiple depths), allowable exceedance frequency 1-in-5 years.
[(b)] summer (July 1-September 30) maximum attached algae, not to exceed.
[(c)] March 1-November 30 average chlorophyll *a* (µg/L) in the mixed layer of lakes (median of multiple depths), allowable exceedance frequency 1-in-5 years.

Direct Use Water Supply: The commission also adopted a new subsection in the provisions about "Uses" to create the DUWS Lakes and Reservoirs sub classification of the domestic water supply use. This sub-classification is applied to specific lakes and reservoirs in certain narrowly-defined situations. For the DUWS lakes and reservoirs, surface water flows (or is pumped) directly to the water treatment facility, where it is treated and then distributed to the service population for consumption; these water supplies are used directly.[(5)] The intent of this sub-classification is to recognize special cases involving vulnerabilities and risks that may not apply to all waters covered under the broader water supply use classification. The commission adopted a chlorophyll *a* value of 5.0 µg/L to protect human health in DUWS lakes and reservoirs. The decision about the need to apply a specific value to protect the DUWS use will be made on a site-by-site basis.

Status of Implementing Interim Numeric Values: During the first phase, the commission has proceeded with the implementation strategy and adopted standards for phosphorus or chlorophyll *a* to protect aquatic life, recreation, and water supply uses only for waters upstream of existing dischargers. The DUWS use sub category has been adopted where lakes meet the class description; however the sub category numeric values have not been applied. As of 2015, standards in three quarters of the state regulatory basins have been addressed; in 2017, the commission will consider the water quality standards for regulation #34 (San Juan and Dolores River Basins) and Regulation #35 (Gunnison and Lower Dolores River Basins). Table 10 presents a summary of the progress.

Table 10 Progress on Water Quality Standards: Implementing 31.17 Nutrients

Regulation# and Basin	RMH year	# Qualified Dischargers	Total # Segments	# Segments with Total Phosphorus Standards [(1)]	#DUWS Lakes
32 Arkansas River Basin	2013	62	142	117	12
33 Upper Colorado River Basin	2014	59	122	109	7
36 Rio Grande Basin	2013	15	101	88	0
37 Lower Colorado Basin	2014	25	131	124	4
38 South Platte River Basin	2015	150	223	138	30

[(1)] including footnote C

Qualified Dischargers: A list of all permitted domestic wastewater treatment facilities discharging prior to May 31, 2012 or with preliminary effluent limits requested prior to May 31, 2012, and any non-domestic facilities subject to Regulation #85 effluent limits and discharging prior to May 31, 2012 was compiled for each of the regulatory basins and called the "Qualified Discharger" list. As part of the rulemaking proceedings, this list was included in the regulation preceding the segment standards tables. Phosphorus and chlorophyll standards were applied as follows:

a. For segments located entirely above these facilities, nutrient standards apply to the entire segment.

[5] Definitions and specific language for this subcategory are at subsection 31.13(1)(d)(i)

b. For segments with portions downstream of these facilities, *nutrient standards only apply above these facilities*. (these segments are identified with a footnote C)

c. For segments located entirely below these facilities, nutrient standards do not apply.

Footnote C has been added when nutrients standards apply to only part of a segment upstream of qualified facilities. Footnote C references the table of qualified discharges at the front of the regulations (for instance at 38.5(4)). This clarification allows permit writers, assessors, permittees or any person looking at the tables to quickly and easily determine that nutrient standards only apply to the portion of the segment above qualifying discharges to that segment.

Site Specific Standards: In recent Regulation #38 rulemaking proceedings the commission adopted a site-specific delay of the total phosphorus standard for several segments. These are segments where data was submitted showing that background phosphorus levels exceed the interim values. In these instances [Cherry Creek Segments 1, 4a and 4b, and Bear Creek Segment 7 (wetland fens)] the commission adopted a delayed effective date of 12/31/2020 so that more information can be gathered about the appropriate standards for these segments.

Section 4
Recommended Changes to Regulation #85 and 31.17 of Regulation #31

In accordance with the commission's triennial review cycle of regulations, a Triennial Review Informational Hearing (TRIH) is scheduled for the "Nutrients Management Control Regulation", Regulation #85 (5 CCR 1002-85) and Section 31.17 of "The Basic Standards and Methodologies for Surface Water", Regulation #31 (5 CCR 1002-31) on October 13, 2015. This is the first triennial review of these regulations, which became effective September 30, 2012. The division will request at the TRIH that the commission schedule a rulemaking hearing to address the issues presented in this memorandum, and will address at the hearing whether any issues presented to the commission from other stakeholders should be added to the scope of the hearing as well.

The division maintains our opinion that the approach taken in 2012 to adopt Regulation #85 and 31.17 of Regulation #31 was the right first step to reduce nutrients in Colorado. The approach allows for a two-part strategy for addressing nutrients and the division believes this is still the best policy option to make effective progress in addressing nutrients management in Colorado at this time. The discussion in previous sections of this report shows that the Regulation #85 monitoring requirements provide the division and Colorado's regulated community information that will be useful for determining the appropriate long-term nutrient control strategy for Colorado. In addition, the sections above summarize the Regulation #85 and 31.17 of Regulation #31 implementation efforts and division believes that these efforts have been successful as we complete the first increment of nutrient reduction in Colorado.

The division has organized its recommendations into five categories:

- Regulation #85 and Section 31.17 of Regulation #31 Phase 2 Effective Date.
- Recommended Changes to 85.5 Specific Limitations for Dischargers of Nutrients.
- Recommended Changes to 85.6 Monitoring Requirements.
- Recommended Changes to Section 31.17 of Regulation #31.
- General Clean-up and Corrections.

4.1 Regulation #85 and Section 31.17 of Regulation #31 Phase 2 Effective Date

Section 31.17 of Regulation #31 states that after May 31, 2022 the interim phosphorus, nitrogen, and chlorophyll *a* values will be considered by the commission when applying numeric standards to individual segments. These segments would include locations downstream of permitted wastewater treatment facilities. In addition, Regulation #85 limitations could apply to domestic wastewater treatment works and nondomestic wastewater treatment works under the provisions outlined in 85.5(1)(a)(ii) Delayed Implementation of Effluent Limits after May 31, 2022. These effluent limits could be included in permits during

the time when the commission is adopting the numeric standards during their typical basin implementation schedule.

The division recommends that the scope of the Regulation #85 and Section 31.17 of Regulation #31 rulemaking hearing include consideration of the Phase 2 Effective date of May 31, 2022. At the time of the hearing, the division may or may not propose a delay in the Phase 2 Effective Date based on:

- Examining technological advances in nutrient removal technologies and if these advances could achieve effluent limitations based Section 31.17 interim values.
- Determining whether monitoring will be required to establish Regulation #85 numeric effluent limitations effects on instream nutrient levels or if this could be accomplished using modeling.
- Establishing the timeframe required to implement a long-term nutrient strategy for Colorado by considering the following potential options:
  - Do nothing and implement Phase 2 as currently envisioned in Regulation #85 and Section 31.17 of Regulation #31.
  - Delayed implementation of Phase 2 as currently envisioned in Regulation #85 and Section 31.17 of Regulation #31 based on technology availability and phasing of required capital expenditures statewide.
  - More stringent effluent limitations for the approximately 50 facilities subject to current Regulation #85 effluent limitations.
  - Identify the most critical areas of the state with respect to nutrients and identify nutrient controls required to protect the designated uses in those areas.

The division does not recommend consideration of revisions to the interim phosphorus, nitrogen, or chlorophyll *a* values in Section 31.17 of Regulation #31 at this time.

4.2 Recommended Changes to 85.5 Specific Limitations for Dischargers of Nutrients

Based on the division's experience with implementing Section 85.5 of Regulation #85 we recommend that the Regulation #85 rulemaking hearing consider the following:

- The division applied Regulation #85 to existing and new facilities. Based on this experience the division recommends Regulation #85 provide a definition of New Domestic Wastewater Treatment Works that will clarify and differentiate the term's use from other commission regulations such as Regulation #22 Site Location and Design Approval Regulations for Domestic Wastewater Treatment Works.
- For facilities not currently subject to the Regulation #85 effluent limitations, the division suggests that these facilities should be allowed to apply for and receive PELs. Regulation #85 does not allow the division to complete PELs for delayed implementation of effluent

limits facilities. Since July 1, 2013, at least one facility requested PELs and the division was not able to accommodate their request.

- The division recommends that the scope of the rulemaking include whether the Regulation #85 effluent limitations should apply to cooling towers. Regulation #85 required cooling towers to submit monitoring data for two years to determine the relative amount of nutrient (if any) that is added to the flow diverted from state waters. The division will review this information and propose whether Regulation #85 effluent limits should apply to cooling towers.

- The division suggests section 85.5 include a reference to 85.6 (Monitoring Requirements). During implementation of Regulation #85 the division found many facilities excluded from effluent limits or that had delayed implementation of effluent limits were not aware that the monitoring requirements apply to all domestic wastewater treatment works and non-domestic wastewater treatment works in SIC Major Category 20.

- The division proposes that the scope of the rulemaking include the Regulation #85 trading provision. The provision as written takes into account instream water quality. While no nutrient trades have been implemented under Regulation #85, one permittee has met with the division to discuss trading and the trading scheme that was discussed at that meeting did not consider instream water quality but contemplated an overall balance in watershed nutrient loading. Prior to recommending any changes to Regulation #85 the division will consider the long-term implementation implications of allowing trades based on watershed loading versus instream water quality.

- The division recommends that the scope of the rulemaking consider whether Regulation #85 should to apply federally operated wastewater treatment works and whether references to Colorado Discharge Permit System permits should also include reference to National Pollutant Discharge Elimination System Permits.

- In the statement of basis and purpose for the 2012 rulemaking, the commission stated an intention to address future monitoring requirements for MS4s in the first triennial review of Regulation #85. The Commission's stated intent was to use the information from the Discharge Assessment Data Reports to understand the significance of MS4s as nutrient sources. The commission also stated the intent to review the information in the Discharge Assessment Data Reports in evaluating the requirements in 85.5(4) for "Municipal Separate Storm Sewer Permit Requirements for Nutrient Source Reductions." Given the Event Mean Concentration value ranges for discharges from MS4s provided in the reports relative to current limits for other point source discharges included in the Regulation #85, the division does not recommend that further nutrient reduction requirements be evaluated for inclusion in Regulation #85 during this triennial review. Instead, the division recommends that the commission continue to rely on the current requirements in 85.5(4) and the requirements in Regulation #61, which direct that CDPS discharge permits for MS4s incorporate requirements for permittees to reduce pollutants, including nutrients, in discharges to the maximum extent practicable. The division will continue to reevaluate its

recommendation for future triennial reviews based on current information and evaluation of the relative contributions from MS4s.

4.3 Recommended Changes to 85.6 Monitoring Requirements

Based on the division's experience with implementing Section 85.6 of Regulation #85 we recommend that the Regulation #85 rulemaking hearing consider the following:

- There is no end date for the Regulation #85 monitoring requirement. The division recommends the scope of the rulemaking include a monitoring end date. We will propose a recommendation for an end date after reviewing data submitted as part of Regulation #85 monitoring requirements, considering the amount of data required to establish a baseline condition, and evaluating whether it is necessary to monitor after each of the approximately 50 facilities have the capability to comply with the Regulation #85 effluent limits.

- In the statement of basis and purpose for the 2012 rulemaking, the commission stated an intention to address future monitoring requirements for MS4s in the first triennial review of Regulation #85. The Commission's stated intent was to develop future regulatory requirements for monitoring, as necessary, to adequately characterize nitrogen and phosphorus contributions from MS4 discharges in Colorado. The commission also stated the intent to review the information in the Discharge Assessment Data Reports in evaluating the requirements in 85.5(4) for "Municipal Separate Storm Sewer Permit Requirements for Nutrient Source Reductions." After review, the division recommends that the reports provide adequate information and data at this time for the evaluation and consideration of relative nutrient contributions from MS4 discharges in Colorado. It is therefore the recommendation of the division that no additional reporting requirements for discharges from MS4s be considered for Regulation #85 during this triennial review. The division intends to reevaluate this recommendation for future triennial reviews pending the further analysis of data, including statewide modeling efforts currently underway.

4.4 Recommended Changes to Section 31.17 of Regulation #31

Based on the division's experience with implementing Section 31.17 of Regulation #31 we recommend that the Section 31.17 of Regulation #31 rulemaking hearing consider the following:

- The division recommends the scope of the rulemaking include clarifications for 31.17(e)(i) or the provision identifying where the 31.17 interim values can be applied prior to May 31, 2022. During the 2014 Regulation #37 rulemaking, the commission determined that Section 31.17 interim values should not be implemented downstream of a cooling tower that was not subject to Regulation #85 effluent limits. In both the 2014 Regulation #37 and 2015 Regulation #38 hearing the commission heard discussion on the meaning of "headwaters" and whether the 31.17 interim values should only be implemented in waters of "high quality". As part of the scope of the Regulation #85 and Section 31.17 of Regulation #31

rulemaking, the division will propose changes to 31.17 consistent with the Commission policy decisions during recent #37 and #38 rulemakings.

4.5 General Clean-up and Corrections

The division expects there to be several types of general cleanup and corrections that would increase the usability and clarity of Regulation #85. The division will also propose to correct typographical and other minor errors. The division's current list of clean-up items for Regulation #85 includes:

- The division proposes all references to running annual median be changed to rolling annual median. Running and rolling are equivalent terms but rolling medians and rolling averages are the terms used in permit implementation polices.
- Include the Hydrologic Unit Code numbers with the watershed names in 85.5(1)(a)(ii)(C).
- Remove reference to the PQLs and Regulation #61 in 85.6(4)(c).
- In several places throughout the regulation there are dates that are no longer relevant and these should be removed.
- Clarify the statement in 85.6(6) for the data submittal through a public repository to read that the Division must be notified by April 1st (not April 15th) that the data will be submitted via a data repository. Also clarify that the data repository must submit the data to us and make it accessible to the public.
- The information required in 86.6(3) Point Source Data Collection – Municipal Separate Storm Sewer System Discharges has been provided to the division and this portion of the regulation can be deleted.
- The cooling tower data collection requirement in 85.6(2)(a) has been fulfilled and can be deleted.

4.6 Next Steps

We have outlined the division's recommendations for the scope of the rulemaking in Items 4.1 through 4.5 above. Should the commission decide to move forward with a rulemaking, the division anticipates that the Colorado Water Quality Forum will form a Regulation 85/31.17 Work Group during the summer of 2016 to collaborate on the proposal for the rulemaking effort, and that a rulemaking hearing could be scheduled for the fall of 2017.