Jordan Nutrient Rules: New Development TAG#2

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Welcome to the second Technical Advisory Group (TAG) for New Development Stormwater Jordan Rule Readoption.

Introductions: please state name, affiliation, relation to Jordan stormwater regulations, and favorite Holiday dessert.

Technical Advisory Group Purpose & Process

Purpose of TAGs:

- To get feedback from stakeholders on current implementation and rule revision concepts.

TAG Process:

- 1st TAG - May 1st - Reviewed foundations of Jordan New Development Stormwater Rule, discussed implementation, reviewed general new concepts and discuss.
- 2nd TAG - Today - Review draft rule concept and take comments.
- 3rd TAG – April 2025.

Intent:

- Close all TAGs in Spring 2024, continue stakeholder meetings as needed
- Draft rules for EMC. Plan to take rules to EMC in late 2025.

Today's Agenda

1. Review Stakeholder feedback
2. Review DWR investigations
3. Present New Dev concept
4. Remaining Questions / Needed Input
5. Next Steps

Stakeholder Concerns & Feedback

- Development patterns
  - Urban vs rural, Small vs large scale, New D vs Expansion
  - Variable LG stormwater mgmt. capacity
  - Umbrella developers w/many builders
- Rule implementation details & challenges
  - Integration with existing permitting, dev closeout processes
  - Difficulty applying to linear/transportation project
  - How to keep “protected” landscapes protected
- Regulatory complexity & risk
  - Complexity of compliance, too many choices, unused regulatory options
  - Complexity of sites, not enough choices, diversity of stormwater programs
  - Project approval process: unpredictability & risk

DWR Investigations

- Jordan (and other NMS) model results
- Limitations of nutrient credit approach
  - Calculation challenges, Credit generation & market challenges
- Changing rainfall patterns, larger storms
  - Nutrient export & public safety
- Developed area hydrologic changes
  - Soil compaction, lack of accounting or mitigation
- Insufficient channel protection, ex/sub/urban nutrient sources
  - Stream erosion as nutrient source
  - BUA densities & SCM design
  - Runoff reduction, Flow concentration & dispersal

Jordan Lake Model Results – Haw Subwatershed

Station Set: Haw Stations

P loading reduction (%) \ Nitrogen Loading Reduction (%)	0%	10%	20%	30%	40%	50%	60%	70%
0%	0.21	0.20	0.18	0.17	0.16	0.16	0.17	0.10
10%	0.19	0.18	0.16	0.15	0.14	0.14	0.15	0.10
20%	0.16	0.15	0.14	0.13	0.12	0.12	0.12	0.09
30%	0.13	0.12	0.11	0.09	0.08	0.09	0.09	0.07
40%	0.10	0.10	0.08	0.07	0.06	0.05	0.05	0.05
50%	0.09	0.08	0.07	0.06	0.05	0.03	0.03	0.03
60%	0.08	0.08	0.06	0.05	0.04	0.03	0.02	0.02
70%	0.07	0.07	0.05	0.04	0.03	0.02	0.01	0.01

Possible Reductions:
- **30% N and 30% P**
- **20% N and 40% P**

Studies outside the model show that its better to have a balance between N and P management for algal dynamics and impacts on both freshwater and marine systems.

→ **If** we do nutrient load tracking for New Dev, these model results would help us determine New Dev export targets.

Jordan Lake Model – New Hope Subwatershed

Station Set: Morgan & Upper New Hope

Nitrogen Loading Reduction (%)

P loading reduction (%)	0%	10%	20%	30%	40%	50%	60%	70%
0%	0.29	0.28	0.26	0.25	0.22	0.17	0.11	0.05
10%	0.29	0.27	0.26	0.24	0.22	0.16	0.11	0.05
20%	0.28	0.26	0.25	0.24	0.21	0.16	0.11	0.05
30%	0.27	0.25	0.24	0.23	0.21	0.16	0.11	0.05
40%	0.26	0.24	0.24	0.22	0.20	0.16	0.11	0.05
50%	0.24	0.23	0.23	0.21	0.19	0.15	0.10	0.05
60%	0.23	0.22	0.21	0.20	0.18	0.14	0.10	0.05
70%	0.22	0.21	0.20	0.19	0.17	0.13	0.09	0.05

Color Scale

0.10	0.13	0.16	0.19	0.22	0.25	0.28	0.31	0.40

Station Set: Middle New Hope

Nitrogen Loading Reduction (%)

P loading reduction (%)	0%	10%	20%	30%	40%	50%	60%	70%
0%	0.25	0.23	0.21	0.18	0.13	0.11	0.09	0.06
10%	0.24	0.22	0.20	0.17	0.13	0.10	0.08	0.06
20%	0.23	0.21	0.19	0.17	0.12	0.10	0.08	0.05
30%	0.22	0.20	0.19	0.16	0.12	0.09	0.07	0.05
40%	0.21	0.19	0.18	0.15	0.11	0.09	0.07	0.04
50%	0.19	0.18	0.16	0.14	0.10	0.08	0.06	0.04
60%	0.17	0.16	0.14	0.12	0.08	0.06	0.05	0.03
70%	0.15	0.14	0.12	0.10	0.07	0.05	0.03	0.02

Color Scale

0.10	0.13	0.16	0.19	0.22	0.25	0.28	0.31	0.40

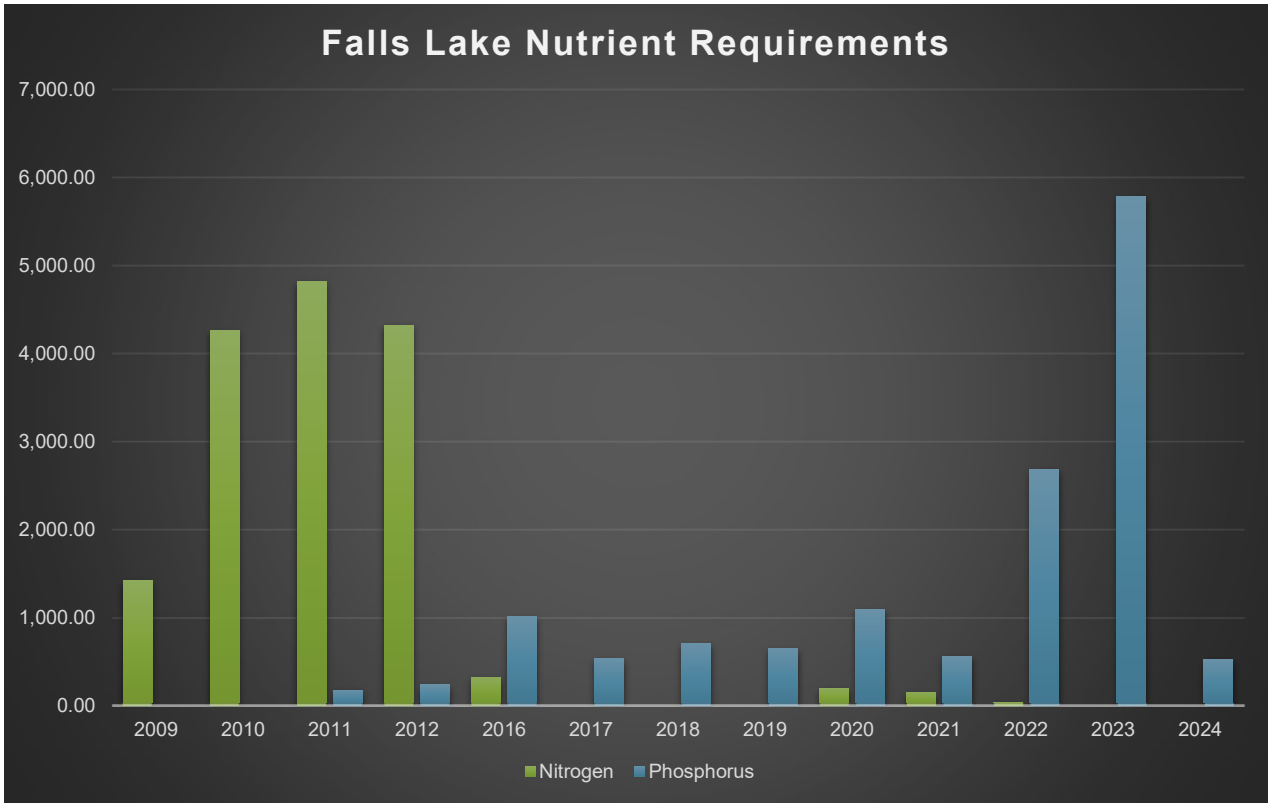
Combined Upper and Lower New Hope, Possible Reductions:

- 50% N and 50% P (upper – 60% N and 50% P; lower – 40%N and 50% P)

- Simplified implementation admin for Wake, Chatham, Cary

→ **If** we do nutrient load tracking for New Dev, these model results would form the basis for creating New Dev export targets.

Credit Market Challenges – Falls Example



Few locations available for nutrient credit generation

Nutrient credits aren't generated in the same ratio as they are acquired for offsets

Leads to excess of N credits relative to P credits

Department of Environmental Quality

Rainfall Changes 1974 to 2022

V_{90} (6-hours inter-event)

WQ storm event (inches)	1974-2003	1991-2020	2013-2022
Wilmington	2.28	2.11	3.06
Raleigh-Durham	1.32	1.51	1.89
Asheville	1.53	1.55	1.98
Charlotte	1.44	1.51	1.59

V_{85} (6-hours inter-event)

WQ storm event (inches)	1974-2003	1991-2020	2013-2022
Wilmington	1.73	1.57	2.21
Raleigh-Durham	1.16	1.18	1.47
Asheville	1.22	1.20	1.62
Charlotte	1.16	1.20	1.27

Construction Impacts: e.g. Virginia CNs & Runoff Coeff

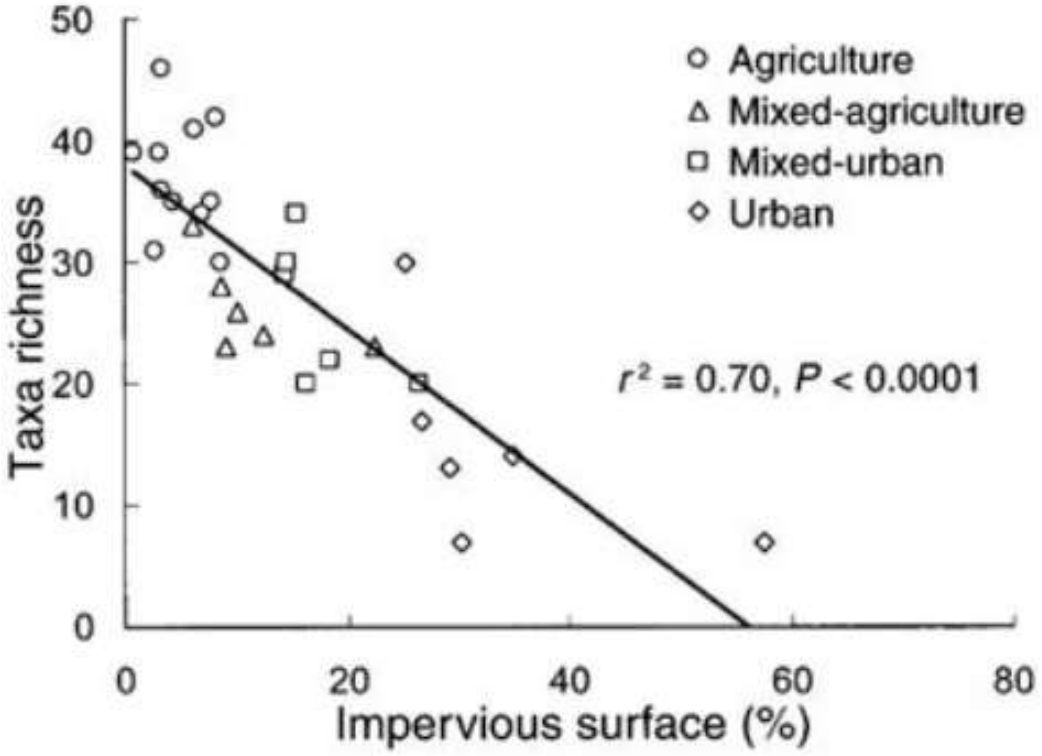
CNs

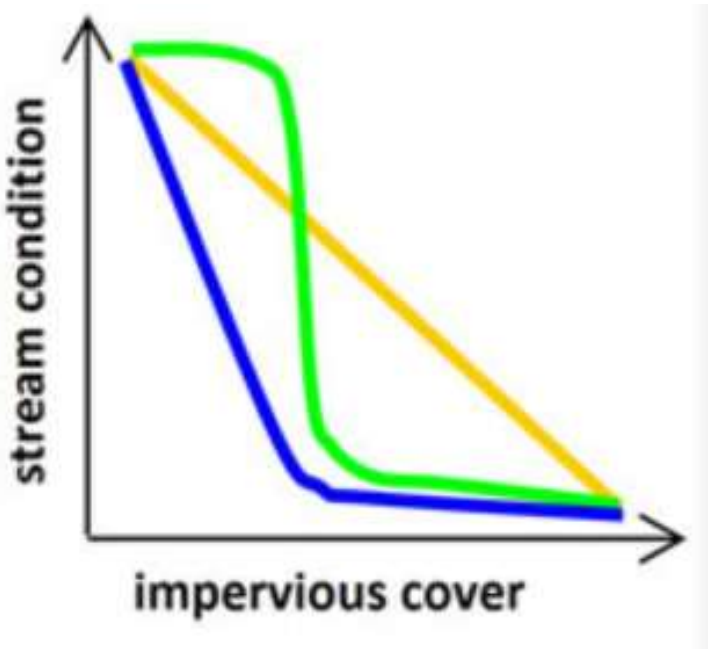
Category	*A*	*B*	*C*	*D*
Forest	30	55	70	77
Mixed Open	34	59	72	79
Managed Turf	39	61	74	80
Impervious	98	98	98	98

Rv Coefficients

Category	*A*	*B*	*C*	*D*
Forest	0.02	0.03	0.04	0.05
Mixed Open	0.08	0.11	0.13	0.15
Managed Turf	0.15	0.20	0.22	0.25
Impervious	0.95	0.95	0.95	0.95

Stream Integrity & Channel protection





https://www.epa.gov/caddis/urbanization-stormwater-runoff

Department of Environmental Quality

General NC Stormwater Paradigm

- BUA-focused → Primary SCMs
- First-flush oriented → single storm depth
- Total suspended solids as proxy for all urban pollutants
- Flood management (peak flow mitigation)
- Prevent further degradation → New BUA focus
- Doesn't consider hydraulic & hydrologic changes to streams

Current NC Stormwater Regulations in Jordan

- NC DEQ implemented:
  - Jordan State & Federal Entities rule - DEMLR implements post-construction requirements
  - Outstanding Resource Waters / High Quality Waters
- Local gov't implemented
  - NPDES MS4 Stormwater rules - Phase I, II communities implement MS4 post-construction requirements
  - Water Supply Watershed rules – local governments implement in WSW areas falling in their jurisdictions
  - Jordan Buffer Protection
- Local stormwater ordinances, depending on authority, may have further requirements
- Jordan New Development Stormwater rule – local implementation barred pending rules readoption

Stormwater Nutrient Management Paradigm

- Whole-site focus → landcover-oriented
- Annual nutrient load contribution
- SCM nutrient reduction performance matters
- Stream stability (channel protection)
- Restore impacted waterbody → reduce impacts from past development if possible

2009 Jordan New Development Stormwater Rule

- Applicability:
  - All jurisdictions: Private dev, State & Federal projects
  - Disturb 0.5ac residential, 12,000sqft other
- Project requirements:
  - Meet subwatershed N, P loading rate targets (lb/ac/yr)
  - Primary SCM required, 1” storm
  - Nutrient calculation for each site
  - Nutrient offset purchase available
  - Peak rate match, 1yr 24hr storm
  - Buffer protection

Questions so far?

Proposed New Dev Stormwater Regulatory Structure

1. Updated Design Storm → 1.2” (80th to 85th % storm of last 10yrs)
2. Whole-site landcover & runoff focus
3. Structural AND non-structural stormwater practices
4. Runoff reduction above 12% BUA
5. 12 to 24% BUA Primary OR Secondary SCM
6. ≥ 24% BUA Primary SCM
7. < 12% BUA with curb & gutter requires SCM too

Objectives of Nutrient Stormwater Redesign

- Keep up with rainfall pattern changes
- Address lower BUA that still has stream impacts
- Address whole site, not just BUA
- Minimum standard for runoff reduction/filtration
- Offer non-traditional stormwater practices at lower BUA
- Keep more stringent stormwater practices at higher BUA
- Address flow concentration due to transportation
- Address construction impacts on permeable surfaces

	No Stormwater Collection System (as defined in 15A NCAC 02H .1002(48))	Stormwater Collection System (as defined in 15A NCAC 02H .1002(48))
BUA < 12%	• Meet Low Density requirements of 2H .1003 (2)	Treat site BUA runoff from 1.2" storm w/primary SCM and meet Runoff Reduction requirement (same requirements as for BUA ≥ 12% below)

12% ≤ BUA < 24%	**Treatment & Runoff Reduction for 1.2" Storm**
	Calculate total site runoff volume post-development w/ VA Runoff Reduction Method. Then either:
	• Meet both of the following -
	  • Treat site BUA runoff w/primary or secondary SCM, and
	  • Reduce *total site runoff volume* via above treatment + other structural and non-structural runoff reduction practices[1] to meet Runoff Reduction Fixed Fraction (below),
	• Or meet post-development runoff volume < pre-development.	

BUA ≥ 24%	Same as 12-24% BUA requirements above except treatment shall be via primary SCM only.	

Stormwater Proposal: BUA < 12%

No Stormwater Collection System:

- Meet Low Density requirements of 2H .1003 (2)

Stormwater Collection System:

- Treat site runoff from 1.2" storm w/Primary or Secondary SCM and
- Meet Runoff Reduction requirement
- (see details for BUA > 12%)

Stormwater Proposal: 12 to 24% BUA

1. Calculate whole-site runoff from 1.2” storm:
2. Either meet both of the following:
   - Treat site BUA runoff with Primary or Secondary SCM, and
   - Reduce total site runoff volume via above treatment + other structural and non-structural runoff reduction practices to meet Runoff Reduction Fixed Fraction (*TBD*)
3. Or:
   - Match post-development runoff volume ≤ pre-development

→ *Volume & reduction calculations using method like VA Runoff Reduction Method*

Stormwater Proposal: > 24% BUA

1. Calculate whole-site runoff from 1.2” storm:
2. Either meet both of the following:
   - Treat site BUA runoff with Primary SCM, and
   - Reduce total site runoff volume via above treatment + other structural and non-structural runoff reduction practices to meet Runoff Reduction Fixed Fraction (*TBD*)
3. Or:
   - Match post-development runoff volume ≤ pre-development

→ *Volume & reduction calculations using method like VA Runoff Reduction Method*

Runoff Reduction – What Is It?

- Percent reduction of post-dev runoff volume from all kinds of landcovers (permeable and impermeable surfaces)
- HSG-specific reduction targets *To Be Determined*

MARYLAND EXAMPLE

Hydrologic Soil Group	EXAMPLE Reduction % of whole site runoff
A	38
B	26
C	13
D	7

- NOT a pre-post Runoff Volume Match

Runoff Reduction – Calculated How?

- Simple Method-based calculation of volume before & after BMPs
- Landcover-specific Runoff R_vs
- BMP-specific % runoff reduction by volume from area treated
- All disturbed soil treated as lawn unless rehabbed / reforested

VIRGINIA EXAMPLE:

Rv Coefficients

Category	*A*	*B*	*C*	*D*
Forest	0.02	0.03	0.04	0.05
Mixed Open	0.08	0.11	0.13	0.15
Managed Turf	0.15	0.20	0.22	0.25
Impervious	0.95	0.95	0.95	0.95

VA Runoff Reduction Calculation Method v4.1

$$Rvsite = \frac{[(Rv_F \times \%F) + (Rv_{MO} \times \%MO) + (Rv_{MT} \times \%MT) + (Rv_{IC} \times \%IC)]}{100}$$

- $Rvsite$ = unitless composite volumetric runoff coefficient for the site
- RvF = weighted forest/open space runoff coefficient across hydrologic soil groups (Eq. 1.1a)
- $RvMO$ = weighted mixed open runoff coefficient across hydrologic soil groups (Eq.1.2a)
- $RvMT$= weighted managed turf runoff coefficient across hydrologic soil groups (Eq.1.3a)
- $RvIC$ = impervious cover runoff coefficient across hydrologic soil groups (Eq.1.4a)
- $\%F$ = percentage of total forest area for the site (Eq.1.1b)
- $\%MO$ = percentage of total mixed open area for the site (Eq.1.2b)
- $\%MT$ = percentage of total managed turf area for the site (Eq.1.3b)
- $\%IC$ = percentage of total impervious cover area for the site (Eq.1.4b)

Runoff Reduction – With What?

- Practices with some aspect of:
  - Evapotranspiration
  - Infiltration / Exfiltration, and/or
  - *"Slow-filtered discharge"*
- All SCMs in SCM Credit Doc 2023 have ET&I % determined
- "Slow-filtered discharge" = bioretention, Silva Cell, Permpave
- Other structural and non-structural BMPs TBD

→ *reviewing Chesapeake BMPs*

Runoff Reduction – Possible New BMPs

Non-Structural Practices:

- Soil rehab / decompaction
- Urban trees (rainfall interception)
- Reforestation

Smaller-scale versions of NC SCMs

Modified NC SCMs with soil rehab:

- Vegetated Filter Strip
- Swales
- Rooftop disconnection

Applicability

Still in progress, what we've got so far:

- Residential disturbance threshold higher than other landuses
- Linear transportation exempt if following NCDOT BMP Manual
- Exempts Net Change BUA ≤ 0

10 min Break

Revisit: Stakeholder Concerns & Feedback

- Development patterns
  - Urban vs rural, Small vs large scale, New D vs Expansion
  - Variable LG stormwater mgmt. capacity
  - Umbrella developers w/many builders
- Rule implementation details & challenges
  - Integration with existing permitting, dev closeout processes
  - Difficulty applying to linear/transportation project
  - **How to keep "protected" landscapes protected**
- Regulatory complexity & risk
  - Project approval unpredictability & risk
  - **Complexity of compliance, too many choices, unused regulatory options**
  - Complexity of sites, not enough choices, diversity of stormwater programs

Your Thoughts?

- Storm size change
- No N and P targets
- Site runoff calculation
- Runoff reduction target for whole site runoff
- Runoff reduction practices
- Primary vs Secondary SCM treatment
- BUA % threshold(s)
- Other applicability thresholds (landuse, disturbance, etc.)
- How to keep “protected” landscapes protected
- Other?

Thank You!

We appreciate your time sending us your comments and any data/reports that can support ND stormwater decisions.

Welcome to email me:
Ellie.rauh@deq.nc.gov

DWR Jordan Website:
https://www.deq.nc.gov/about/divisions/water-resources/water-planning/nonpoint-source-planning/jordan-lake-nutrient-strategy