

Denver's E. coli Story: What Have We Done and Learned in 10 Years?

Jon Novick, Environmental Administrator
Denver Dept. of Public Health & Environment

Jeff Williams, Supervisory Engineer
Denver Department of Public Works

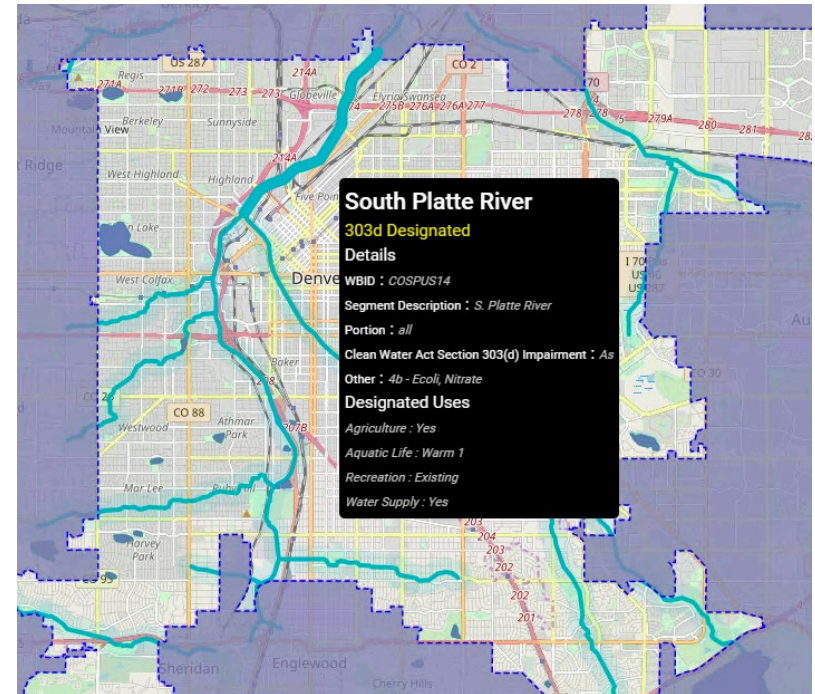


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Segment 14 E. coli TMDL

- Added to 303(d) list in 1998
- TMDL Approved October 2007
 - Protect Recreational Uses and Public Health
- Density / Concentration Based
 - WLA = 126 CFU / 100 mL E. coli
 - LA = 126 CFU / 100 mL E. coli



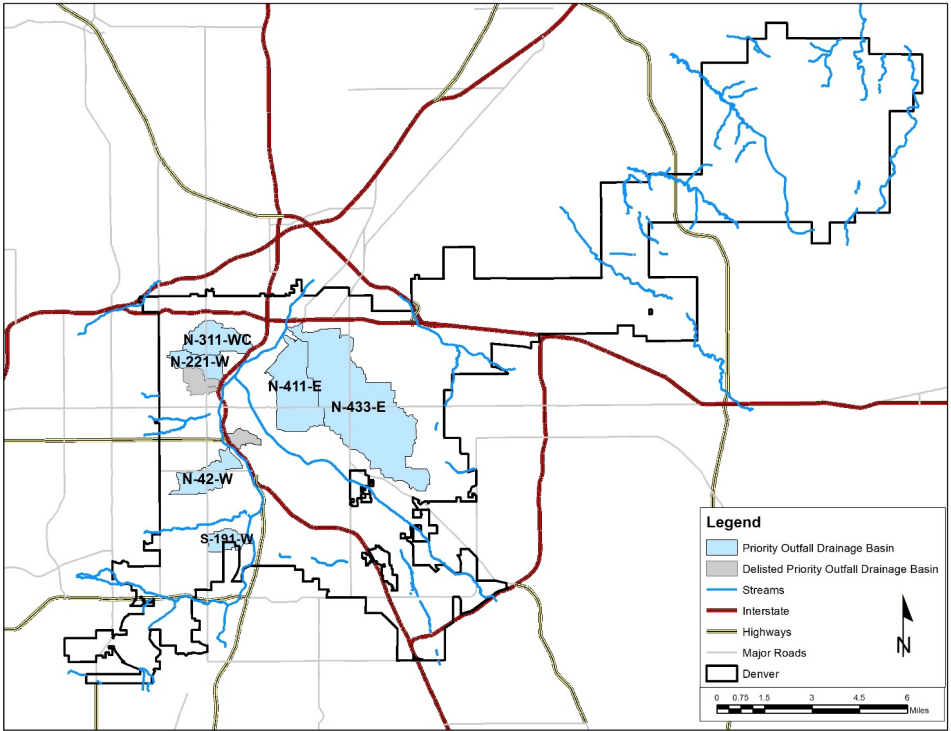
Current Permit Requirements for E.coli Mitigation

- Dry weather discharges from all priority basins must meet the wasteload allocation of 126 CFU / 100 ml for E. coli
- Development and implementation of:
 1. E. coli Control Plan
 2. System Maintenance Program
 3. Storm Sewer Markers
 4. Education & Outreach
 5. Additional Programs & BMPs

1. E. coli Control Plan

- Monitoring Plan
- Identify Outfalls of Concern
 - >5 gpm dry-weather flow
 - >126 CFU/100ml
- Initially identified 10 priority basins, now 6 active basins
- Outfalls of Concern sampled 4 times per year min.
- Other sampling points for reference

Priority Outfalls



Focus on 8 Priority Outfalls Identified in Permit

2. System Maintenance Program

- Storm Sewer Cleaning
 - Mains, laterals, inlets, siphons, manholes
- Sanitary Sewer Investigation and Correction
 - Review cctv, identify cross-connections, broken taps, etc.
 - Sanitary lining program
- Storm Sewer Investigation
 - Identify portions with higher potential of E.coli source
 - Conduct follow-up such as televising, rehab, additional cleaning, maintenance



Image courtesy of cleaner.com

3. Storm Sewer Markers

90% of public inlets marked to discourage dumping



4. Education & Outreach

- School-based Education
- Communications to Promote Public Awareness
 - Brochures, website, booths at community events, etc.
 - Pet Waste
 - Illicit discharge



Images courtesy of Donny Rousch – Denver Public Works

5. Additional Programs & BMPs



End of Pipe Treatment

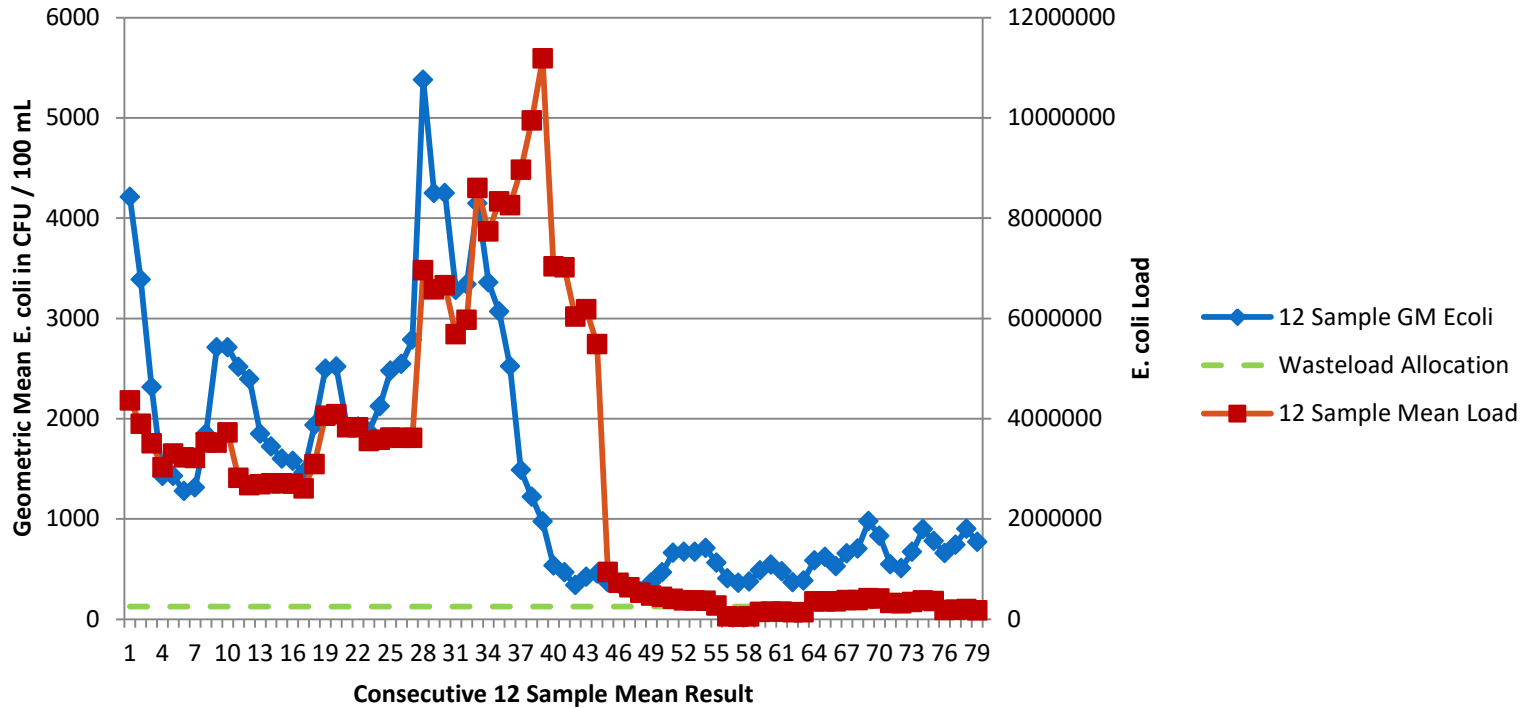
- Infiltration Gallery
- Biochar
- Proprietary Media
- Ozone
- Ultra Violet Treatment

Implementation Costs

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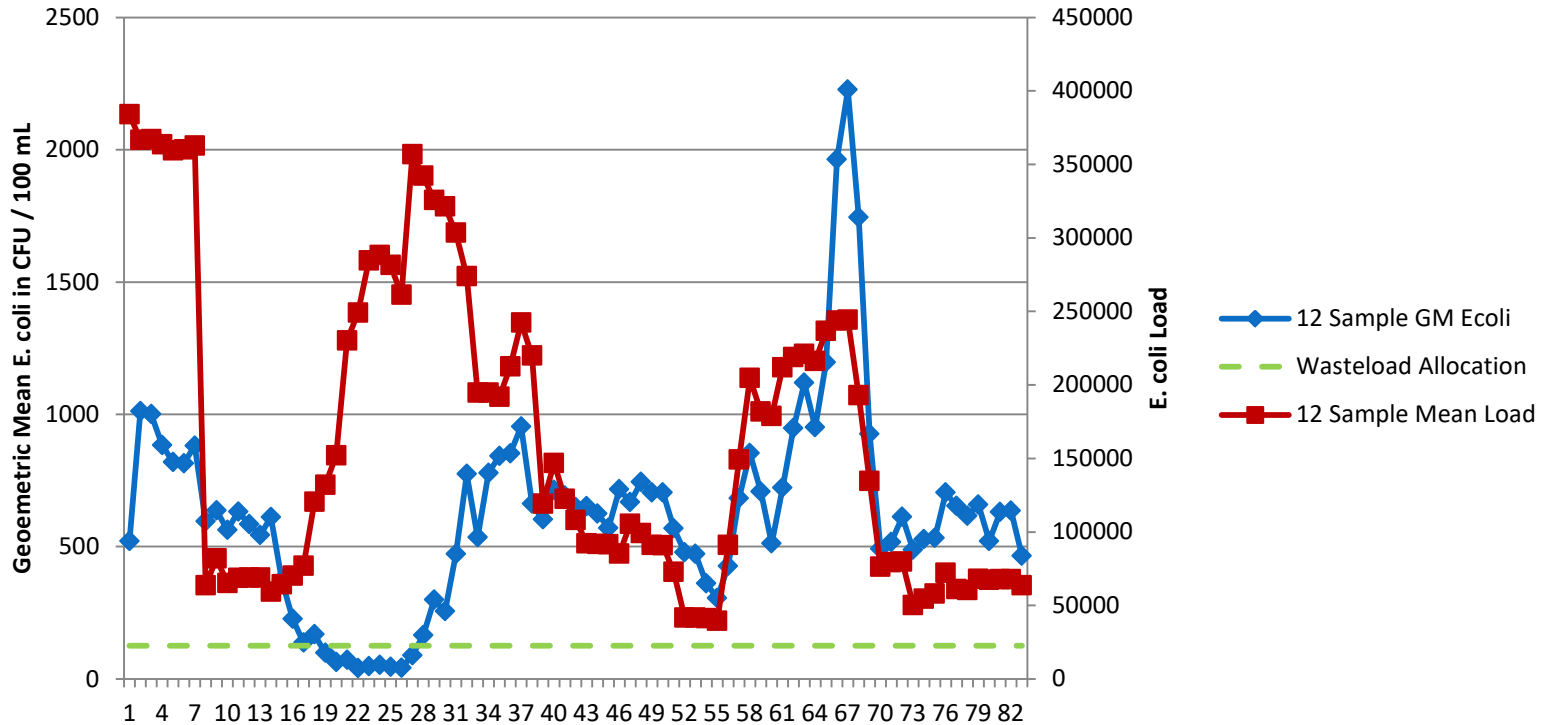
Success Stories

N-433-E

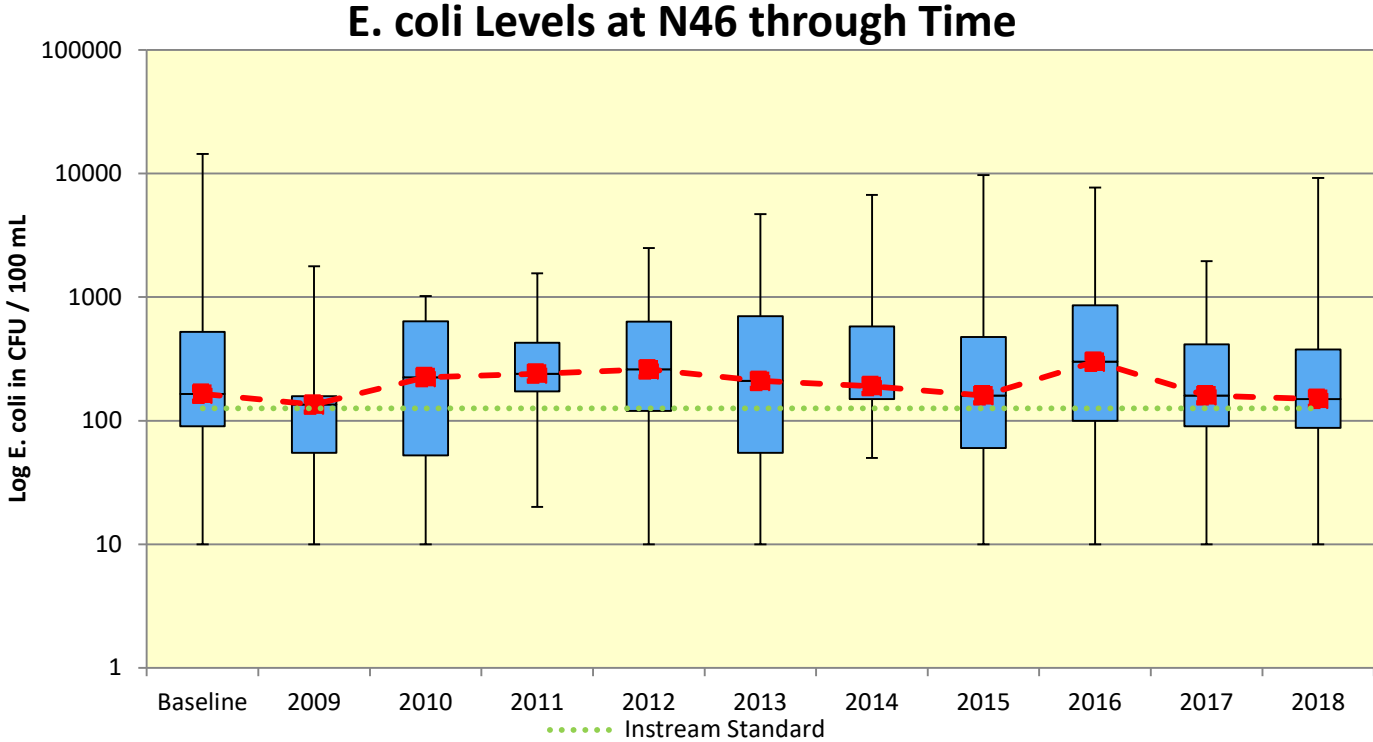


No Easy Solutions

N-411-E



Impacts on Receiving Waters



Reflections and Lessons Learned



Infrastructure Maintenance

- Initially Provides a High Cost / Benefit Ratio
- Diminishing Returns
- May Achieve Compliance for Smaller Storm Drainage Basins



Receiving Water Impacts



- Minimal Apparent Improvements
- Are Actions Taken Protecting Public Health?

End of Pipe UV – the Magic Band Aid

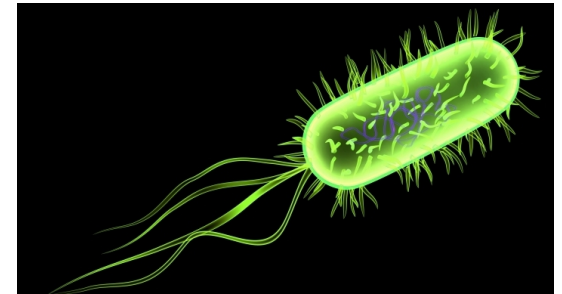


Image courtesy of Fox31 News

Microbial Source Tracking

Pros

- Useful for Directing Implementation Efforts
 - Human vs Wildlife Sources
- Path to Compliance?
 - Site Specific Standards



Cons

- MS4 Responsibility
- Denver's MST Efforts Largely Inconclusive

Other Thoughts



- Load vs. Concentration Based TMDLs
- Urban Campers

Next Steps

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- Address Wet Weather Flows
 - Green Infrastructure Implementation Strategy
 - Green Infrastructure Monitoring
- Focus on Other Streams
- Others?

Questions?

Jeffrey.Williams@denvergov.org, 303-446-3588

Jon.Novick@denvergov.org, 720-865-5468



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