The Gray and The Green: Teaching water infrastructure

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Consider every school...

...as a collection of education infrastructure:

- Building
- Grounds
- Utilities (water, power, electricity, communications)
- HVAC system
- IT
- Playground equipment
- Tables, chairs, desks, boards, etc.
Water infrastructure...

...has four systems:

– Drinking water
– Sanitary sewer
– Stormwater
– Natural watershed

*The first two are isolated by design.*

*The second two are interconnected by nature.*
Watersheds are infrastructure
Stormwater & natural watersheds

GRAY OR GREEN
GRAY infrastructure is hard and angular.
GREEN infrastructure is soft and rounded.
Stormwater permits (MS4s) require public outreach and education
Convergence in 2012 of Urban Waters Federal Partnership, Denver 2020 Sustainability Plan, and Next Generation Science Standards
STEM education helps accomplish municipal objectives
Keep It Clean – Neighborhood Environmental Trios (KIC-NET)
What is a kick net?
What is KIC – NET?

Keep It Clean – Neighborhood Environmental Trios

- School + waterway + park with rec center
- Content + process + project
- Public Works + Parks and Recreation + school district
KIC-NET in Denver & Albuquerque

CO: 29 schools (including 4 in Lakewood), 131 educators, ~2,000 students, 88% FRL, 92% children of color

NM: 10 schools, 26 educators, 754 students, 78% FRL, 91% children of color
What are the outputs?

• **Toolkit creation**
  • 152-page activity guide with 30+ place-based lessons (2nd Edition, CO + NM versions)
  • Correlations to Next Generation Science Standards, Common Core State Standards, and Guidelines for Excellence in Environmental Education
  • stream monitoring equipment and references

• **Instructional partnership**: Professional Development, Lesson-planning, Co-facilitation, & Culminating Activities

• **Evaluation**
  • Quantitative: pre-test/post-test participant surveys (n = 213 for 2014; 58 for 2016)
  • Qualitative: interviews using Most Significant Change Technique (n = 9 for 2014; 11 for 2016)
What are the outcomes?

- 65% of pre/post survey items showed statistically significant gains in watershed stewardship attributes
- Qualitative themes: “increased academic engagement/achievement,” “sense of empowerment” & “conservation behaviors”
- 84 student-led environmental action projects, such as...
New in 2017: School-scale Green Infrastructure

- Nudging projects into measurable environmental impacts, improving water quality on and near campuses
- Rain garden pilots on private/school district property, involving City assets
- Facilitate conceptual design, cost estimating, construction, and maintenance
- Assist establishing public-private partnership agreements
- Develop stormwater monitoring station(s)

Students will slow it down, spread it out, and soak it in.
Shoemaker School

- Opened 2015 as Expeditionary Learning school for ECE-3 - 5th grade on banks of Cherry Creek
- Campus includes regional stormwater treatment with trash vault, 1.5-acre-foot pond, and outfall/amphitheater
- Plans to install water quality monitoring station in pond, with students as design consultants and technicians
- Partnering with faculty on water units and outdoor learning
St. Rose of Lima Catholic Academy

- Expeditionary Learning school for Pre-K - 8th grade, in a mostly Hispanic parish, 0.6 mile to South Platte River at Johnson Habitat Park
- Campus/church block has little pervious surface
- A 2-year study by 7th and 8th graders produced formal proposals for a green roof and a rain garden
- Presented to City water quality managers in August
- Public Works “green-lighted” the project, including use of City assets
- Moving into conceptual design and cost estimating now
Thanks for & to...