# Keep It Clean-Neighborhood Environmental Trios (KIC-NET)

A Toolkit for Civic Engagement, Environmental Education, and STEM of the South Platte River Urban Watershed

# Colorado edition

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## Introduction

# What is KIC-NET?

Keep It Clean – Neighborhood Environmental Trios, or KIC-NET, is Earth Force's stormwater partnership. KIC-NET applies Earth Force's award-winning Community Action and Problem-Solving Process to address local environmental challenges related to stormwater.

A kick net is a low-tech, time-honored tool of aquatic ecologists used to capture bottom-dwelling stream organisms. It's versatile, easy-to-use, and has no batteries that can run out of power. A kick net is an exciting device to introduce children to their watersheds and hyper- local environmental health conditions. Collecting critters from a stream and checking them out – up close for the first time – is, without fail, a joyful and unforgettable educational experience.

### KIC-NET IS...

- An **EVOLUTION** of Denver Public Works' stormwater education and outreach programs that stem from a campaign to "Keep It Clean...from Drain to Stream," which is part of the city's requirements for its municipal separate stormwater sewer system (MS4) permit under the Clean Water Act.

- A **COLLABORATIVE EFFORT** where agency goals are braided together. Public schools get integrated instruction fostering twenty-first century problem-solvers, Public Works benefits from behavior changes that improve water quality, and other watershed stakeholders benefit from better stewardship.

SCHOOLS

EARTH FORCE

STORMWATER MANAGERS

WATERSHED STAKEHOLDERS
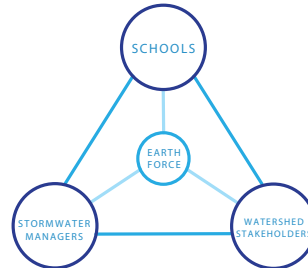
- A **LOCATION** where a public school, a waterway or body of water, and a city park (ideally with a recreation center) are within such close proximity that they become a shared learning space for students and their adult guides (known as a KIC-NET site).

- A **CIVIC ACTION** by young people who scan their neighborhood's environment, select an issue to investigate, discover cause-and-effect information about that issue, devise a solution to it, and then apply that strategy to impact their community – in meaningful, lasting, and positive ways.

### WHY KIC-NET?

There may be no more powerful a unifier than water. In an educational setting, water is more than a theme. Water ties all disciplines together, drives a need to know in students, dissolves the often-artificial boundaries between social and environmental components of communities, and – as D.h. Lawrence reminded us a century ago – contains hydrogen, oxygen, and also magic. Water is wonder-full, that is, full of wonder. Why not harness wonder and magic, and make them part of learning?

There is incredible power in returning to the same place many times. Repeated experience with a spot compels one to delve past mere awareness and prompts one to action on behalf of this well-known place. It enriches your mental landscape. You learn there's a name for everything, but that just knowing names is far from understanding how any place works, as a whole, as a collection of intertwined systems. Labels don't explain how the parts fit together to perform the work of an ecosystem. Or, a city for that matter.

When one starts to tease out detailed explanations and construct an appreciation of systems at work, one begins to build knowledge that can be applied. Application is the truest test of education.

KIC-NET is designed to help you as an educator as you guide your students to apply learning locally and relevantly. KIC- NET relates water quality and land use with quality of life and environmental health. KIC-NET challenges young people to examine their immediate surroundings, assess conditions they find, focus on something found wanting, and – this is the clincher – do something about it.

Introduction

# Community Action and Problem-Solving Process: Lesson Overview

WATER QUALITY

MONITORING

URBAN ENVIRONMENT

STORMWATER MANAGEMENT

COMMUNITY HEALTH

## Launch | Go Team KIC-NET!

| lesson | name | learning objectives | time | handouts | page |
|---|---|---|---|---|---|
| L.1 | Bucket Brigade (K-5) | • While cooperating on a team, experience the volume-weight ratio of water, through the hard work of hauling water.<br>• Consider the difficulty of supplying water in places lacking indoor plumbing.<br>• Appreciate the convenience of easily accessed water, as well as cascading social issues when access is difficult. | 20-45 min. | LA, LB | 36 |
| L.2 | Clean-up Crew (6-8) | • Cooperate as a small group, to engineer a solution to a challenging problem.<br>• Infer the real-world challenges inherent in cleaning up polluted waters. | 20-45 min. | | 39 |
| L.3 | Create a Watershed (K-5) | • Visualize a watershed and how it works.<br>• Recognize ways in which human behaviors and natural forces affect the overall health of a watershed. | 45-75 min. | | 42 |
| L.4 | Watershed Tarp (6-8) | • Construct a three-dimensional model of a watershed, complete with topography, human-made and natural landscape elements, pollutants, and best management practices.<br>• Differentiate between point and non-point sources of pollution.<br>• Evaluate best management practices (or even propose better ones) for reducing non-point source pollutant loads in the learners' urban watershed. | 45-75 min. | | 45 |

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# Community Action and Problem-Solving Process: Lesson Overview

## Step One | Inventory Your NET

| lesson | name | learning objectives | time | handouts | page |
|--------|------|---------------------|------|----------|------|
| 1.1 | Watershed Walkabout (K-8) | • Observe conditions of the KIC-NET site with care, then record observations with attention to details.<br>• Analyze data to assess watershed conditions. | 60-90 min. | 1A | 54 |
| 1.2 | Watery Inspection: Field Work (K-5) | • Explain how to conduct a watershed inventory.<br>• Conduct a thoughtful inventory of your KIC-NET site.<br>• Identify environmental issues and strengths at your KIC-NET site. | 60-90 min. | booklet, 1B | 57 |
| 1.3 | Watery Inspection: Water Quality Testing (6-8) | • Explain how to conduct water quality tests as part of a watershed inventory.<br>• Conduct precise and accurate water quality tests at your KIC-NET site. | 45-60 min. | 1C | 67 |
| 1.4 | Watery Inspection: Macroinvertebrate Sampling (6-8) | • Understand that macroinvertebrate populations depend on water quality and serve as indicators of that water quality.<br>• Calculate Pollution Tolerance Index (PTI) for a stream by identifying macroinvertebrates in a substrate sample. | 30-90 min. | 1D, 1E | 71 |

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## Step Two | KIC-NET Issue Selection

| lesson | name | learning objectives | time | handouts | page |
|---|---|---|---|---|---|
| 2.1 | Downriver Community (K-5) | • Distinguish various physical elements of a community.<br>• Categorize strengths and issues, and make connections between them.<br>• Reflect on the impact of pollution on downstream communities. | 30-60 min. | | 94 |
| 2.2 | Watershed Connections (6-8) | • Describe aspects of your own community.<br>• Explain how watershed health and communities of people are interrelated. | 45-60 min. | 2A, 2B | 97 |
| 2.3 | Ripple Effect (K-5) | • Describe the issues at your KIC-NET site, using the concepts of community, stakeholders, interdependence, and cause and effect.<br>• Analyze your KIC-NET site's issues in sufficient depth to prepare students to make an informed issue selection. | 60-90 min. | 2C, 2D, 2E | 102 |
| 2.4 | What Did We Find? (6-8) | • Analyze water issues related to your KIC-NET site.<br>• Categorize policies and practices related to your KIC-NET site. | 45-60 min. | 2F, 2G | 108 |
| 2.5 | Water Pick (K-8) | • Select an issue to address at your KIC-NET site.<br>• Use criteria-based decision making and at least one other democratic process.<br>• Participate in respectful consensus-building. | 45-60 min. | 2H | 113 |
| 2.6 | Design a Storm Drain (K-5) | • Design a device to filter trash from entering a model storm drain.<br>• Compare inventions' efficiency and usability within the group.<br>• Assess ways of reducing one form of pollution in stormwater. | 30-60 min. (15-20 min. set up) | | 117 |

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# Community Action and Problem-Solving Process: Lesson Overview

## Step Three | KIC-NET Discovery

| lesson | name | learning objectives | time | handouts | page |
|--------|------|---------------------|------|----------|------|
| 3.1 | Know Where It Goes Stormwater Game (K-5) | • Explain definitions of "runoff" and "stormwater." <br>• Demonstrate how small, individual amounts of wastes accumulate in runoff. <br>• List practices to prevent pollutants from entering waterways. | 30-60 min. | pollutant cards | 125 |
| 3.2a | Stormwater Pollution Audit: Mapping and Retrofitting (6-8) | • Identify pollutants in local stormwaters using multiple methods of water quality monitoring. <br>• Assess the quality of water at your KIC-NET site using data from these tests. <br>• Describe environmental impacts from any identified impairments. <br>• Evaluate a variety of green infrastructure options for improving conditions at your KIC-NET site. | 1.5 to 4 hrs/ day for 5+ days | 3A | 130 |
| 3.2b | Stormwater Pollution Audit: Water Quality Testing (6-8) | • Identify pollutants in local stormwaters using multiple methods of water quality monitoring. <br>• Measure and collect data on the physical, chemical, and biological parameters of your KIC-NET site. <br>• Assess the quality of water at your KIC-NET site using data from these tests. <br>• Associate water quality data with possible sources of pollutants in the watershed. | 1.5 to 4 hrs/ test (plus transport) | | 137 |
| 3.3 | Who Polluted Our KIC-NET Site? (K-5) | • List multiple sources of pollutants from a variety of users of site's watershed. <br>• Identify behavioral changes users can make to lessen their impact. | 30-45 min. | character cards | 141 |
| 3.4 | How Much of Our Neighborhood is Impervious? (6-8) | • Differentiate between pervious and impervious surfaces. <br>• Calculate the percentage of impervious surface in your KIC-NET site's watershed. | 45-60 min. | 3B | 148 |
| 3.5 | One in 100 (6-8) | • Conduct a statistical sample to reflect a 1% annual probability of flooding. <br>• Connect chances of selecting one particular item in 100 to the concept of 100-year flood. | 30-60 min. | | 152 |
| 3.6 | Made-up Macros (6-8) | • Using data from water quality testing and other observations from their KIC-NET inventory and/or discovery, envision how pollution affects a surface water ecosystem through the creation of an imagined macroinvertebrate creature. <br>• Re-contextualize findings from their KIC-NET inventory and/or discovery through an artistic practice that distinguishes fact from fiction. | series of 3-10 45-to-75-minute blocks | | 155 |
| 3.7 | What Should We Change? (K-8) | • Determine which policies and/or practices are most in need of improvement related to your KIC-NET issue. <br>• Assess benefits and costs of making a positive change to policy or practice related to your KIC-NET site. | 45-60 min. | 3C | 158 |

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# Community Action and Problem-Solving Process: Lesson Overview

## Step Four | Selecting a Strategy

| lesson | name | learning objectives | time | handouts | page |
|---|---|---|---|---|---|
| 4.1 | Ground Truthing through Field Work and Experts (6-8) | • Confirm data and findings through review of environmental inventories and water quality testing at your KIC-NET site.<br>• Contact KIC-NET site experts for support in honing strategies and goals of your KIC-NET action project. | two blocks of 90 min. ea. | 4A | 170 |
| 4.2 | Stating a Goal and Choosing a Strategy (K-8) | • Select one policy or practice that needs to be improved.<br>• Select the most appropriate strategy to achieve the desired improvement.<br>• Develop and post a project goal and strategy statement. | 60-90 min. | 4B, 4C, 4D, 4E | 174 |

## Step Five | Your KIC-NET Project

| lesson | name | learning objectives | time | handouts | page |
|---|---|---|---|---|---|
| 5.1 | How To Put On Waders (K-8) | • Write a sequential and clear procedure for a seemingly simple task.<br>• Recognize the logical thinking and attention to detail needed for step-by-step planning. | 45-60 min. | | 186 |
| 5.2 | Make Your KIC-NET Action Plan (K-8) | • Collaborate to develop an action plan.<br>• Form committees to carry out tasks on the action plan.<br>• Schedule implementation of tasks of each committee. | 45 min. to two hours | 5A, 5B | 189 |
| 5.3 | Do Your KIC-NET Project (K-8) | • Carry out the tasks from the action plan, including gathering necessary resources.<br>• Execute tasks (by the responsible committees).<br>• Adjust the action plan if obstacles arise.<br>• Compile artifacts along the way. | varies by project | | 195 |

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## Step Six | Telling Your Story

| lesson | name | learning objectives | time | handouts | page |
|---|---|---|---|---|---|
| 6.1 | KIC-NET Story Template (K-8) | • Create a project story to share far and wide, as well as locally.<br>• Recognize and appreciate the scope of their accomplishments. | two 45-minute blocks | 6A | 201 |
| 6.2 | Looking Back and Looking Ahead (K-8) | • Evaluate their overall experiences with the program.<br>• Synthesize learning and identify ways to apply this knowledge in the future. | 45-90 min. | 6B, 6C | 205 |