Girl Scouts in Science Discovering Wyoming Water

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OVERVIEW
Girl Scouts in Science: Discovering Wyoming Water is a year-long program funded by Wyoming EPSCoR to increase participation of girls in Science, Technology, Engineering and Math (STEM). Our program is comprised of two components: 1) A citizen science research project and 2) Wyoming Water Workshops. To date this program has engaged 50 Laramie Girl Scouts or 45% of the total Laramie scout population.

WHY?
• Teach science as it is practiced (Houseal 2014)
• Young women want to do STEM but often fall behind male peers (National Summary Report 2002)
• Engage girls in science at a critical age (Chen & Howard 2010)
• USA Girl Scouts are committed to STEM education
• Build Girl Scout’s collaborative skills (Csikszentmihalyi 1999)
• Increase appreciation of place – Place-based Education
• Provide outreach opportunities for University of Wyoming faculty and graduate students

COMPONENTS

   - Define question
   - Gather information
   - Generate testable hypotheses
   - Design study
   - Collect data
   - Analyze
   - Interpret data
   - Draw conclusions
   - Disseminate results
   - Ask new questions

2) Water Workshops in which University of Wyoming female faculty and graduate students engage scouts in water-related topics.

   Single Evening Workshops
   • Water Adaptations in Vertebrates by Dr. Elizabeth Wommack
   • Water Quality of Stream & Tap Water by Hilary Madinger
   • Designing Program Badges by Jaci Henion
   • Fish Anatomy & Fish Prints by Dr. Katie Wagner
   • Water Loving Raccoons by Dr. Sarah Bensen-Amram, Lauren Stanton, Lisa Barrett & Sarah Daniels
   • Winter Insect Ecology by Kennan Oyen
   • Pollinators by Delina Dority
   • Riparian Birds by Libby Megna
   • Exploring the Effects of Rainfall on Tropical Birds by Dr. Corey Tarwater

   Multiple Evenings
   • Nature Journaling by Bethann Merkle (2 meetings)
   • UW Fish Lab by Dr. Frank Rahel & Bryan Maitland (4 meetings)

OUTCOMES
Girl Scouts did science!
• Generated testable hypotheses
• Collected useful data
• Calculated statistical analyses
• Will share their findings with peers and the public
• Stimulated interest in science and STEM-related careers
• Demonstrated that the restoration improved the Laramie River

Table 1. Girl Scouts collected and analyzed data from the restored area and upstream control along the Laramie River, Wyoming. They collected aquatic invertebrates, benthic organic matter, mean particle size of rocks, canopy cover along the margin of the river and water velocity and depth along stream channel profile. The density of all invertebrates, family richness and density of mayflies, stoneflies and caddisflies (EPT; sensitive families) of invertebrates were calculated from Hess samples.

Citizen Science aligns to Next Generation Science Standards (NGSS)
• Our program aligned with many NGSS as determined by Meghan Lockwood’s Masters of Science in Natural Sciences

Scouts earned badges designed specifically for this program

COLLABORATORS
Tony Hoch, Laramie Rivers Conservation District
Marie Frick, Troop Leader for Laramie Scouts
Sally Leep, Juanita Wardell & Andrea Kenney of Girl Scouts of Montana and Wyoming
Brent Ewers & Sarah Konrad of Wyoming EPSCoR

<table>
<thead>
<tr>
<th>Component</th>
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<th>Restored</th>
<th>P-Values</th>
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<tr>
<td>Density (ind/m2)</td>
<td>550</td>
<td>300</td>
<td>0.15</td>
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<td>Family richness</td>
<td>4</td>
<td>2.5</td>
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<td>Density of EPT (ind/m2)</td>
<td>140</td>
<td>107</td>
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<td>Mean of aquatic matter (grams)</td>
<td>0.03</td>
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<td>Mean particle size (mm)</td>
<td>0.27</td>
<td>0.21</td>
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<td>Canopy cover</td>
<td>0.63</td>
<td>1.34</td>
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<td>Water velocity (ft/s)</td>
<td>0.32</td>
<td>0.35</td>
<td>0.0002</td>
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Figures:
- Figure 1: Scientific Process
- Figure 2: Table 1
- Figure 3: Woman and child with clipboard
- Figure 4: Girl Scout with fish
- Figure 5: Water Workshop participants

References:
Na;ional	Summary	Report	2002)