

# Runoff with Chunky the Chicken

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## Objective of the Lesson:

This lesson is designed to introduce students to:

- ✧ The on-farm nutrient cycle – Feed to manure, to soil, and back to the feed.
- ✧ The generation of runoff during rainstorms.
- ✧ The contents of runoff water are more than water alone.

## Standards Addressed:

Science

| K-3   | 4-5  | 6-8  |
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| <b>Standard 1</b><br><i>Nature and Application of Science and Technology</i><br>A-1 | <b>Standard 1</b><br><i>Nature and Application of Science and Technology</i><br>A-1, A-2 | <b>Standard 1</b><br><i>Nature and Application of Science and Technology</i><br>A-1, A-2 |
| <b>Standard 5</b><br><i>Earth's Dynamic Systems</i><br>B-1                          | <b>Standard 5</b><br><i>Earth's Dynamic Systems</i><br>B-1                               | <b>Standard 5</b><br><i>Earth's Dynamic Systems</i><br>A-4<br>B-2                        |
| <b>Standard 8</b><br><i>Ecology</i><br>A-2  | <b>Standard 8</b><br><i>Ecology</i><br>A-1<br>B-2  | <b>Standard 8</b><br><i>Ecology</i><br>B-1   |

Agriscience

| 6-8  |
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| <b>Standard 7</b><br><i>Natural Resource and Environmental Careers</i><br>B-8, B-9 |

## Materials Needed:

*Part A: Nutrient Cycle*

- ✧ Chunky the chicken (if available)
- ✧ Bucket of corn for Chunky the chicken.
- ✧ Bucket of chicken litter or manure.
- ✧ Corn plant.

*Part B: Rain and Runoff*

- ✧ Jar with holes punched in the lid
- ✧ Paint trays (to fill with soil).
- ✧ Soil
- ✧ Grass sods or other material to construct artificial buffer or wetland in paint trays
- ✧ Clear plastic cups for collecting runoff

### Teaching Tips:

- ✧ Groups of 2 - 4 students can work on each paint tray. This will allow each student to participate directly in the design and implementation of a plan for trapping sediments and/or nutrients in runoff.
  - ✧ The runoff collected in Part B of this exercise should be taken to the "Super stream keepers", where it can be analyzed using nitrogen test kits.
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### Procedure:

#### Part A (Approximately 10 minutes)

1. Using Chunky, the corn plant, and the soil explain the on-farm nutrient cycle.
  - ✧ Explain nutrient imbalance on livestock farms.
  - ✧ Cover nutrient and sediment losses (agricultural, urban, and suburban) and how they are related to ground cover/cropping systems.
  - ✧ Explain the possible negative effects of nutrient and sediment losses, including eutrophication and groundwater pollution.
2. Explain methods to limit nutrient and sediment losses in runoff

#### Part B

1. Break students up into groups of 2- 4. Allow each group to pack a runoff tray (paint trays) with soil and create buffers/wetlands. The instructor should prepare a runoff tray with no modifications for comparison. (Approx. 15 minutes)
2. Apply "simulated" rainfall to the paint trays using the jar with holes in the lid. Collect the runoff in clear plastic cups. Manure should be applied to the surface of some soil trays prior to generating runoff. (Approx. 15 minutes)

#### Part B

1. Compare runoff clarity and discuss the processes the impact water quality. (Approx. 10 minutes)
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### Check for understanding:

#### Possible Questions

1. What is runoff?
2. What is erosion?
3. What is eutrophication?
4. How can runoff from crop fields impact surface water?
5. How can runoff from your lawn impact surface water?
6. What can we do to reduce the impact of runoff on surface water quality?

#### Suggested Answers

1. Water that does not infiltrate into the soil runs across the surface and is deposited into a surface water body like a lake, stream, pond, bay, or ditch.
2. Erosion is the process of carrying soil from one location to another. Wind and surface runoff are two mechanisms of erosion.

3. Eutrophication is when a surface water body produces a lot of vegetation or algae. Increased nutrient concentrations can accelerate eutrophication, especially phosphorus in freshwater. Eutrophication can occur naturally as a water body ages.
  4. By delivering sediments and nutrients it can decrease water clarity and increase eutrophication. Algae blooms and increased aquatic plant production can hurt aquatic animal populations (especially fish and shellfish). Pesticides can also introduce toxins into the freshwater. The use of impaired water bodies can be limited: drinking water, recreation, fisheries, etc.
  5. The same as above, but dissolved nutrients and pesticides are typically more of a problem than erosion or sediment transport.
  6. Treatment of water from storm sewers by constructed wetlands and retention ponds. Limiting nutrient applications, buffer strips, constructed wetlands, cover crops, etc. can help reduce agricultural impacts.
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### **Summary of learned material:**

Runoff water differs due to many reasons. At different locations any one factor or combination of factors may change the runoff water that is created. Below is a list of aspects that should be considered when examining runoff waters.

- ✧ Nutrient concentrations
- ✧ Sediment concentrations

Factors that change runoff water chemistry:

- ✧ Soil nutrients.
  - ✧ Manure nutrients
  - ✧ Manure incorporation
  - ✧ Sediment content
  - ✧ Topography - more energy for erosion on steeper slopes (can be compared to skiing)
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### **Additional Resources:**

*General sites – Surface Runoff:*

<http://www.ext.vt.edu/pubs/envirohort/426-722/426-722.html> - Very comprehensive site.

<http://www.gov.on.ca/OMAFRA/english/engineer/facts/87-040.htm>

*Preventing Surface Runoff:*

<http://www.deq.state.or.us/wq/nonpoint/npsfact.htm>

*General sites – Eutrophication*

<http://www.epa.gov/maia/html/eutroph.html>