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**Solving the Manure Mystery**

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**Challenge: Make manure management education fun for youth!**

- Educational value
  - Math: Weight VS volume, manure spreader calibration
  - Environmental science: Nutrient runoff, soil health, water quality
  - Problem solving: Storage solutions



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Lesson 1

**Lesson 1: The Weight is Right!**

- Learning Objective:
  - Youth will be able to calculate how much manure a horse produces annually



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### Background: How much does a horse eat?

1000 lb Horse

20 lb Hay

5 lb Grain

7 Gallons of Water = 58 lb Water

A horse poops about 10 times a day!

Pound (lb)

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### Daily Manure Production of 1000 lb Horse

How heavy am I?

1 Day = 50 lb

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### Calculate Manure Production for 1000 lb Horse in 1 Year

50 lb Manure/Day

2000 lb = 1 ton

$50 \text{ lb manure/day} \times 7 \text{ days} = 350 \text{ lb manure/week}$

$350 \text{ lb manure/week} \times 4 \text{ weeks} = 1,400 \text{ lb manure/month}$

$1,400 \text{ lb manure/month} \times 12 \text{ months} = 16,500 \text{ lb manure/year}$

or

$16,500 \text{ lb manure/year} / 2000 \text{ lb} \sim 8.4 \text{ tons manure/year}$

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## Slide 6

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**CS3** Create Canva Drawing for horse in Pasture  
Christine Skelly, 3/8/2019

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### Annual Manure + Dirty Bedding (Stall Waste) Production

50 lb Manure/Day + 20 lb Bedding/Day = 70 lb Stall Waste

2000 lb = 1 TON

70 lb waste/day X 7 days = 490 lb waste/week  
 490 lb waste/week X 4 weeks = 1,960 lb waste/month  
 1,960 lb waste/month X 12 months = 23,520 lb waste/year

or

23,520 lb waste / 2000 lb ~ 11.8 tons waste/year

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### Lesson 2: Turn Up the Volume!

- **Learning Objective:**
  - Youth will develop a general understanding of how much space horse manure can fill through the course of a year

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### Calculating Manure Volume

Manure Volume = Length X Width X Height = 0.90 ft<sup>3</sup>

12 inches (in) = 1 Foot (ft)

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### Yearly Manure Volume

Volume in 1 year



$12\text{ ft} \times 12\text{ ft} \times 6\text{ ft} = 864\text{ ft}^3$



$18.6\text{ ft} \times 6.6\text{ ft} \times 7\text{ ft} = 860\text{ ft}^3$

12 inches = Foot (ft)

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### Lesson 3: Manure & Water Don't Mix!

• **Learning Objectives:**  
After completing these activities, youth will be able to:

- Describe the composition of manure
- Discuss manure nutrients in relation to water quality
- Describe potential runoff scenarios
- Explain where to store manure on a horse farm to protect water quality



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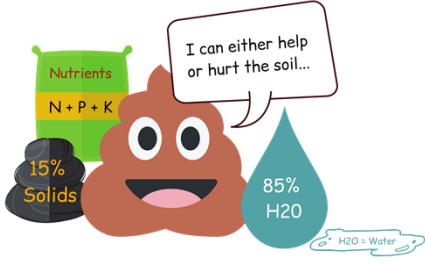
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### Manure Composition



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**Slide 10**

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**CS7**    Make sure calculations are tight for 1 year?  
Christine Skelly, 3/8/2019

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### How do We Prevent Runoff?

The diagram illustrates three scenarios of runoff prevention. In the 'BAD' scenario, rain falls on a green hill with a yellow sun in the background. Below the hill, there are three circles labeled 'P', 'N', and 'K', representing nutrients. In the 'BETTER' scenario, rain falls on a green hill with a brown compost pile on top. In the 'BEST' scenario, rain falls on a green hill with a brown house on top and a brown compost pile next to it. The bottom of the diagram shows a blue body of water with a fish and some green plants.

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### Composting Manure

The diagram shows the composting process. On the left, a brown pile of manure is shown with a thermometer and a shovel. A green arrow points to a compost pile in the middle, which is being watered by a yellow watering can. Another green arrow points to a blue wheelbarrow on the right, which contains compost and a small green plant. Below the compost pile, the text 'Let's Compost!' is written.

Top 5 Benefits

1. Reduces volume by 1/2
2. Decreases odor
3. Kills weed seeds
4. Kills disease
5. Stabilizes nutrients

Let's Compost!

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### Model Farm Activity: X Marks the Spot

A photograph showing several students in a classroom setting. They are gathered around a table, working on a model farm activity. One student is holding a small object, possibly a piece of the model. The background shows other students and classroom furniture.

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**Slide 13**

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**CS11** Christine Skelly, 3/9/2019

**Slide 15**

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**CS12** Christine Skelly, 3/9/2019



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### Lesson 4: Measure of Manure Spread on Land (Large-Scale Demonstration)

- **Learning Objective:**  
After completing these activities, youth will be able to:
  - Demonstrate how to calibrate a model manure spreader



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### Lesson 5: Calibrating the Manure Spreader (Small-Scale Demonstration)

- **Learning Objective:**  
After completing these activities, youth will be able to:
  - Demonstrate how to calibrate a model manure spreader

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### Calibrating Your Manure Spreader


$$\begin{matrix} \text{Manure on} \\ \text{Sheet (lb)} \end{matrix} \times \begin{matrix} \text{Correction} \\ \text{Factor (21.8)} \end{matrix} \div \begin{matrix} \text{Square ft of} \\ \text{Sheet (L X W)} \end{matrix} = \begin{matrix} \text{Tons of} \\ \text{Manure/Acre} \end{matrix}$$

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### Resources: Webinars and Videos

- [Horse Manure](#). Ann Swinker. [MyHorse University/YouTube](#)
- [Manure Management Strategies](#). Jamie Cohen. [MyHorseUniversity/YouTube](#)
- [How Green is Your Farm?](#) Ann Swinker. [MyHorseUniversity/YouTube](#)
- [Environmentally Friendly Horse Management](#) Jennifer Nadeau. [MyHorseUniversity/YouTube](#)



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### Resources: Bulletins and Articles from Michigan State University Extension

- [Manure and Water Don't Mix](#)
- [What is Composting?](#)
- [Composting – How Do I Do That?](#)
- [An 8 step process for developing a horse manure management plan: Part 1 – 8](#)
- [Utilizing a Sacrifice Lot for Your Horse](#)



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### Resources

- [Manure Spreader Calibration](#). North Dakota State University Extension Service
- [Manure Spreader Calibration](#). RutgersNJAES/YouTube



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