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Great Falls, VA 22066

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## Colvin Run Mill Historic Site



*Simple Machines*

# Learning Kit

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## Introduction

Thank you for scheduling a field trip to Colvin Run Mill Historic Site. We hope you and your students find your visit to be both educational and enjoyable. This Learning Kit provides you with information to introduce your students to the site and to reinforce concepts learned during your visit. It includes **Standards of Learning** objectives, educational themes, a brief history of the site, a list of vocabulary words, and worksheets. Please feel free to adapt these materials to your needs and to make copies of this information.



c. 1811

During the visit, your students will go to **three learning centers** where they will learn how simple machines made work easier and they will use some simple machines. They will also discover the inter-dependence of local rural economics, the impact of geography on the development of communities in northern Virginia and the importance of transportation routes for commerce.



In the **barn**, students use four simple machines that made work easier in the days before electricity.



In the **general store**, students discover a thriving commercial center for the town and a hub of social activities. Students handle historic household items and identify simple machines.



In the **mill**, students learn how grain was ground into flour or cornmeal by the water-powered grinding stones and how simple machines helped automate the process.



## Educational Objectives

### Science Standards

3.2, 4.2, 6.2

*Force, Motion and Energy* objectives from the *Science Standards of Learning* include:

Students will investigate and understand simple machines and their uses and see examples of simple machines at work that made the miller's job easier.

### History & Social Science

3.1

*Skills* and *Economics* objectives from the *History and Social Science Standards of Learning* and the *Virginia Studies Standards of Learning* include:

Students will learn that in the 19<sup>th</sup> century a vital rural community of farmers, craftspeople, and merchants grew up around Colvin Run Mill.

1.5, 1.6

Geography and transportation routes determined the location of the mill along Colvin Run. The students will learn how these factors also influenced the location and growth of the 19<sup>th</sup> century community.

3.8, 3.8

In the 19<sup>th</sup> century, Colvin Run Mill was a merchant mill. The students will learn how producers (like the miller) used natural, human, and capital resources to produce specialized goods in the past.

VS.1, VS.6, VS.9

Colvin Run Mill operated commercially from about 1811 to the mid-1930s. The students will learn about the social and commercial lives of ordinary Virginians during the 19<sup>th</sup> and early 20<sup>th</sup> centuries.

## Educational Themes

### Energy

*Energy* is the capacity to do work. Basic energy sources — water, muscle, heat and wind power — have not changed since the beginning of time. What has changed is *technology*, the ways and means these energy sources are utilized to perform work. Examples of 19<sup>th</sup> century technology interpreted at Colvin Run Mill are simple and compound machines, hand-powered tools, a water-powered gristmill with its sophisticated system of gear-operated machinery, and simple heating and lighting methods.

### Community

A *community* is a group of people with common interests, especially those living in the same area. Primarily a rural, agricultural community, the 19<sup>th</sup> and early 20<sup>th</sup> century Colvin Run community survived intact for over a century despite wars and recessions, technological advances and industrialization. The mill at Colvin Run played a pivotal role within that community.

## A Brief History of Colvin Run Mill

Colvin Run Mill, Fairfax County's award-winning operational water-powered gristmill, is a tribute to the enterprising spirit of America's past. Long before the mill was an active business, the land on which it was built was associated with several famous Virginians. In August 1739, Colonel John Colville received grants from England's King George II of almost 10,000 acres in what would become Fairfax County. He soon sold much of this land to William Fairfax. When Fairfax died in 1753, a 275-acre parcel of this property along Difficult Run was conveyed to his son Bryan Fairfax. In 1760 or '61, **George Washington** purchased the Difficult Run tract from Bryan Fairfax.

Washington recognized the potential of Colvin Run as a mill site with a good water supply, hardwood forests for building material and located on a major transportation route leading to market at the port of **Alexandria**. However, the pressing business of waging war and governing the new nation prevented Washington from acting on his plans for his property along Difficult Run.

Colvin Run Mill was built between **1802-1811**. In 1811 William Sheppard purchased 90 acres of Washington's 275-acre

parcel from Washington's heirs and immediately conveyed it, along with a standing mill, to Philip Carper. In 1813 Carper paid the first known taxes on flour and cornmeal produced here.

For more than a century, a series of merchant millers operated Colvin Run Mill. Unlike custom millers who ground grain for individual orders, **merchant millers** bought and sold grain and flour to serve local and foreign markets. Grain products from Colvin Run Mill were exported through the port of Alexandria.

A thriving community of farmers, craftspeople and merchants grew up around the mill. Nineteenth century gazettes and business directories refer to numerous blacksmith shops and country stores nearby. The **c. 1900 Colvin Run General Store**, once located across the road from the mill, has been restored as part of Colvin Run Mill Historic Site.

The mill operated for more than 120 years, and its most prosperous period was 1883 to 1934 when the **Millard family** rebuilt the millrace and millpond and modernized the machinery. The greatest change was in the grinding process when a new roller mill — the latest in modern 19<sup>th</sup> century tech-

*"I have been informed that some person has petitioned or is about to petition the Court of Loudoun for an Acre of the Land I bought of you on Difficult to Build a Mill on. . ."*

George Washington to Bryan Fairfax, 1783



nology — was installed and proved to be more efficient than the old-fashioned millstones. By 1930, it was estimated that over one million bushels of grain had been processed through Colvin Run Mill!

After the Millards sold the mill, it sat idle and neglected for 30 years until **1965** when the **Fairfax County Park Authority** acquired it and began its restoration. Because the building and machinery had undergone such fundamental change over its commercial life, the restoration was based on the plans of **Oliver Evans** (1755-1819) whose innovations revolutionized milling in the early 19<sup>th</sup> century. The mill's derelict ruins revealed a number of similarities to the floor plans and cross sections printed in Evans' 1795 book *The Young Millwright and Miller's Guide*.

Today's visitor sees the results of many skilled craftspeople who have,

quite literally, recreated the past. They repaired the structure, made the bricks and glass, hand-hewed timber to precise specifications and assembled the machinery. All the gears in the mill, with the exception of a few steel parts included for safety, were handmade from wood. As in the early 19<sup>th</sup> century, the mill operates solely by **water power**. Water from Colvin Run is diverted into a pond and millrace and then flows over the 20' wooden overshot waterwheel to provide the power that turns the gears and operates the machinery.

Traditionally, the homes of famous people and the sites of momentous events have been preserved while the buildings used by ordinary people seldom survive. Colvin Run Mill represents a time when wood and water performed important work and communities prospered in support of such enterprise.

## 19th Century Livelihoods

**Directions:** Draw lines to match the words in each column with the pictures in the middle.

### Storekeeper

A person who sells goods and provides services to customers.



### Anvil

A heavy iron block on which heated metal is shaped.

### Carpenter

A person who builds or repairs wooden structures.



### Weighing Scale

A device to measure the weight of a product that is sold by cost per pound.

### Blacksmith

A person who heats iron in a fire and shapes it into many useful items.



### Millstones

Large round stones used for grinding grain.

### Farmer

A person who raises crops or animals for sale.



### Shaving Horse

A bench with a foot-operated clamp to hold wood steady as it is shaped.

### Miller

A person who grinds grain to make flour or cornmeal.



### Plow

A tool with a heavy blade used for cutting up soil to prepare for planting.

## *Oliver Evans' Automated Mill*

### *A Symphony of Simple Machines*

Colvin Run Mill is filled with simple machines that accomplish important tasks to make the miller's job easier.

#### Lever

**A stiff bar that moves about a fixed point (fulcrum). Used to push, pull, or lift things.**



Levers are used to operate the sluice gate and beam scale, and to engage the gears and raise and lower the grinding stone.

#### Wheel & Axle

**A rod attached to a wheel. Used to move or turn things.**

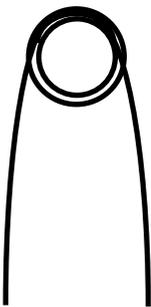


Gears are wheels & axles with teeth that prevent slipping.

In the mill, the power from the greater and lesser face gears change direction via the wallower gears. Gears are also used to change force or speed. *Speed* is increased when a small gear is turned by a large one (greater face to wallower) and *force* is increased when a large gear is turned by a small one (wallower to lesser face).

#### Pulley

**A wheel with a rope wrapped around it. Used to lift heavy objects by changing the direction or amount of the force.**



In the mill, the grain elevator is a four-story pulley that automatically carries grain upstairs.

In the General Store, the windows are opened by a rope and pulley — pulling down on the rope raises the window.

**A flat surface that is raised so one end is higher than the other. Used to move heavy objects up or down.**

In the mill, the shoe controls the flow of grain falling into the grinding stones and the shaker assembly regulates the flow of flour or meal across the sifting screen. The stairs and chutes in the mill are other examples of inclined planes.

#### Inclined Plane



**Wide at one end and pointed at the other, to form a point. Used to cut or split things.**

The furrows cut into the grinding stone are wedges that cut up the grain into flour. Nails are wedges, and the tapered point means you don't have to hammer as hard to drive the nail in. Hand tools like the draw knife are wedges with handles.

#### Wedge



**An inclined plane wrapped around a cylinder or cone. Used to hold objects together or move things.**

Metal screws open the flume gates and raise the grinding stones. Archimedes screws, hidden inside wooden boxes throughout the mill, move grain horizontally.

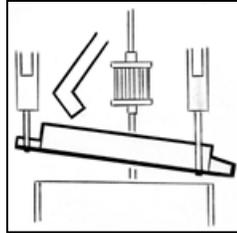
#### Screw



## Simple Machines Make the Miller's Job Easier!

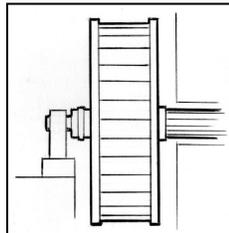
**Directions:** Draw lines to match the words in each column with the pictures in the middle.

**Pulley**



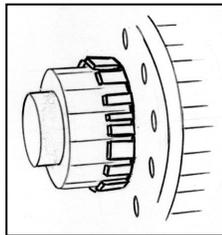
A stiff bar that moves about a fixed point (fulcrum).  
Used to push, pull, or lift things.

**Screw**



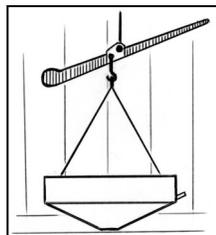
Wide at one end and pointed at the other, to form a point.  
Used to cut or split things.

**Lever**



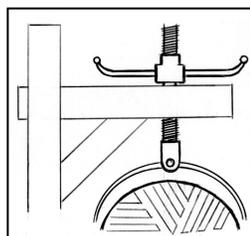
A rod attached to a wheel.  
Used to move or turn things.

**Inclined Plane**



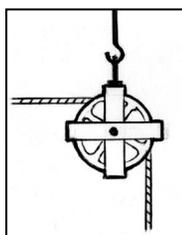
A wheel with a rope wrapped around it.  
Used to lift heavy objects by changing the direction or amount of the force.

**Wedge**



An inclined plane wrapped around a cylinder or cone.  
Used to hold objects together or

**Wheel & Axle**



A flat surface that is raised so one end is higher than the other.  
Used to move heavy objects up or

## Vocabulary List

\* Denotes an example of, or something that includes, a simple machine.

\***Auger [screw, wedge & lever].** A hand-powered tool used to drill holes in wood.

\***Beam scale [lever].** A device used by the miller to weigh grain.

**Blacksmith.** A person who makes tools, household items and other things from iron.

**Community.** A group of people with common interests, especially those living in the same area.

**Chute [inclined plane].** A ramp that carries grain and flour down a level to the next step in the milling process.

\***Draw knife [wedge & lever].** A two-handled knife used while seated on a shaving horse to shape wood into tool handles, barrel staves and wheel spokes.

**Dusty.** The miller's helper or apprentice, so called because they were often covered in flour dust.

\***Fanning Mill [wheel & axle, lever, inclined plane].** Cleans grain of unwanted materials, called chaff (soil, grass, bugs, etc.). Fan is able to blow off chaff because it is lighter than grain.

**Flour.** The product made by grinding wheat.

**Flume.** The wooden trough that carries water from the mill race to the waterwheel.

\***Gear [wheel and axle].** A wheel with teeth or rods made to fit together with other gears so that one gear's turning causes the other gear to turn.

**General store.** A shop, usually found in a small community, that carries a variety of goods including food, tools, medicines and other household necessities.

**Grain.** The small hard seed of wheat, corn, rice or oats. Bread and cereals are made from ground grain.

\***Grain elevator [pulley].** A continuous cloth belt with attached cups that moves grain or flour between floors in the mill.

**Gristmill.** A mill that grinds grain into flour (wheat) or meal (corn).

**Millstones [cutting surface = wedge].** A pair of large round stones between which grain is ground. Uses furrow to cut, not smash, grain into flour.

**Miller.** The person who operates the mill.

**Mill race.** The channel that carries water from the mill pond to the waterwheel and returns it to the stream after the water passes over the waterwheel and powers the mill.

\***Shaker Box [inclined plane].** Sifts flour into different grades based on size. For example, wheat flour was sifted into fine white flour, shipstuff (similar to whole wheat), and bran, while corn was sifted into cornmeal and grits.

\***Stone crane [screw & lever].** A device used to lift the top mill stone. Using the stone crane, the miller can lift a one-ton mill stone alone.

\***Waterwheel [wheel and axle].** A large wheel made to be turned by moving water. A waterwheel powers Colvin Run Mill.

## Colvin Run Mill Historic Site Contact Information

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<https://www.fairfaxcounty.gov/parks/colvin-run-mill>

Not all the **BIG WHEELS**  
are in Washington

The mission of Colvin Run Mill Historic Site is to maintain, develop and interpret the site's historic buildings, collections and resources for the enrichment, education and enjoyment of Fairfax County residents and visitors.



## Site Map

