BEGIN RESTORATION

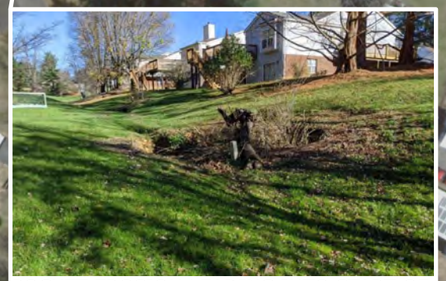
EXISTING OUTFALL

SLEEPY HOLLOW ROAD NW

CHANNEL STABILIZED VIA EXISTING ROCK WALL

ERODING CHANNEL CUTTING THROUGH BMP

PINCH POINT CAUSED BY NARROWING OF STREAM VALLEY



POCKET EROSION LEADING INTO START OF CHANNEL

EROSION AT SPRING OUTFLOW, SEVERAL INSTANCES IN UPPER SECTION

WOODEN SHOE COURT NW

END RESTORATION AT CAMEO COURT

EXISTING STORMWATER BMP

CAMEO COURT

Legend

- Existing Stream Channel
- Stormwater BMP

Sleepy Hollow Stream Restoration

Site Overview

100 50 0 100 Feet

N E S W

What is a Stream Restoration?

Great Blue Skimmers are brightly colored dragonflies that are also called King Skimmers due to their large body size. Adults have black bands and spots on their wings and they are most active during peak summer months.

Pickerel Frog have rectangular shaped spots on their bodies. They eat small invertebrates, such as beetles, ants and caterpillars, and protect themselves from predators by producing toxic skin secretions.

Green Heron are beautiful birds that have grey, green and chestnut colored feathers. They often hunch by the water's edge and wait patiently in order to surprise fish with their dagger-like bill.

Herbaceous Plants such as Cardinal Flower thrive along moist areas such as streams. The summer-blooming scarlet flowers are attractive to people and hummingbirds, as well as other pollinating insects.

Woody Plants such as the American Sycamore also thrive at the edge of streams. They have smooth, whitish bark that peels off, and brown "button-balls" as fruits.

Elderberry is a common stream-side plant that provides a food source for birds and other animals. Elderberry is also commonly used in jams, wines and pies and is high in vitamin C.

THE PLACE TO BE.
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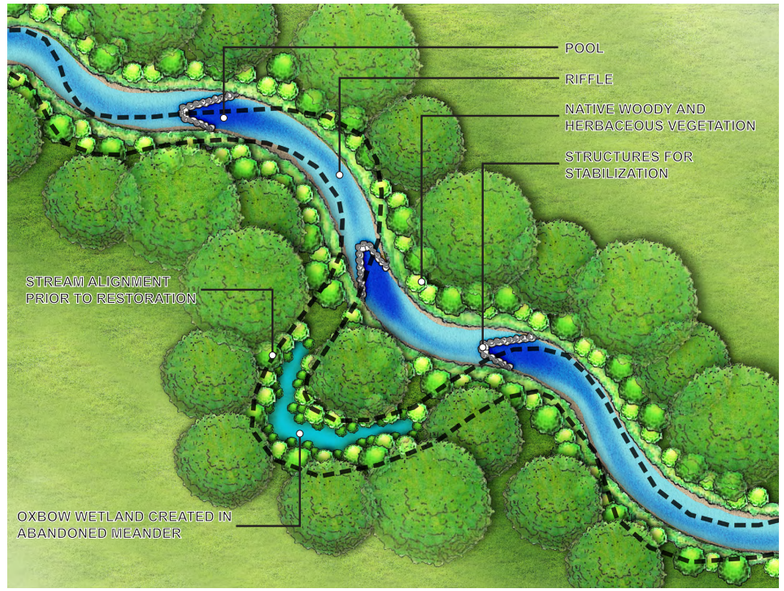
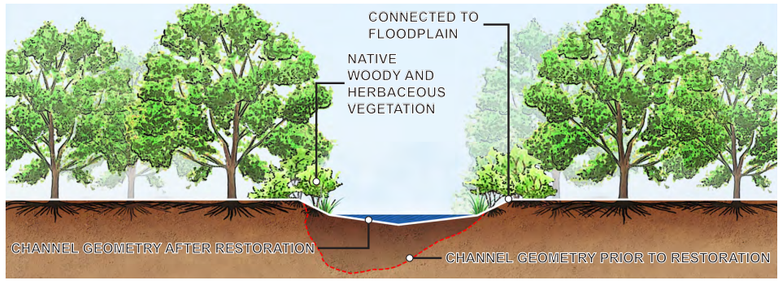
A stream is a dynamic system that includes not only the active channel but also the floodplain and the vegetation along the banks. A natural stream remains stable while transporting a wide range of flows and sediment produced in its watershed.





Fun Facts

Montgomery County spans the Eastern Continental Divide; depending on your location, water will drain to the Gulf of Mexico (via the New River) or the Atlantic Ocean (via the James or Roanoke River).

There are approximately 1,040 miles of stream in Montgomery County. That's long enough to stretch a stream all the way from Christiansburg to Dallas, Texas!

The New River is recognized as the second oldest river in the world and may be anywhere from 10 to 360 million years old.

The stream at Sleepy Hollow drains to Crab Creek, which is considered impaired by the Virginia DEQ. Lessening erosion in Sleepy Hollow will ultimately improve the health of Crab Creek by reducing incoming sediment.

Stream restoration is the process of returning a degraded stream to conditions that are healthier, cleaner, and more natural for wildlife and aquatic life. Restoration establishes habitat for diverse species, reduces bank erosion, and improves water quality.

Urban development increases imperviousness of a watershed. This changes the hydrologic balance and results in a significant increase in runoff. Streams, the main recipients of runoff, make room in the channel by eroding the banks and bed resulting in wider and deeper channels. This results in unstable streams with poor habitat and water quality.

A stream may be restored through activities, such as replanting native vegetation along streambanks and reshaping the channel to create a stable stream using natural channel design techniques. Natural channel design techniques use engineering, geological and biological principles to improve the hydrology, habitat and aesthetics of a stream. Natural channel design techniques aim to restore and maintain natural stream functions over the long term.

a beautiful way to improve water quality

MODIFIED CROSS VANE

BEFORE STABILIZATION WITH MODIFIED CROSS VANE

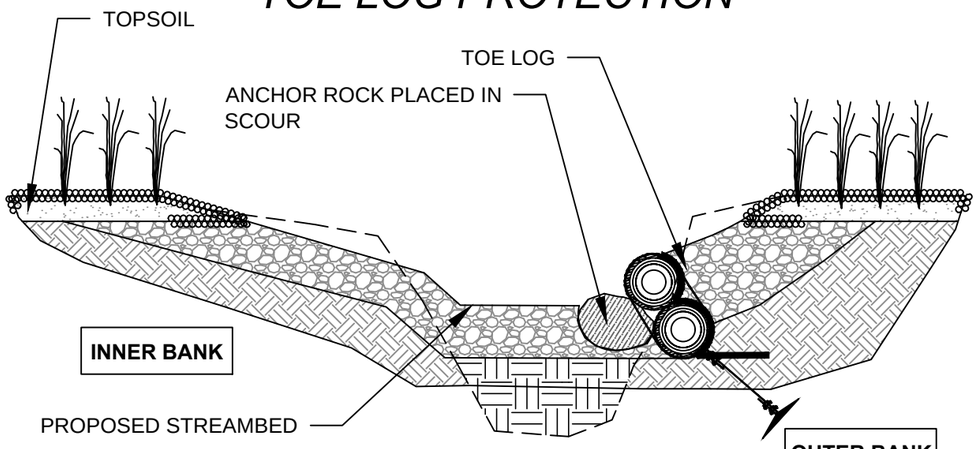
MODIFIED CROSS VANES ARE USED TO PROTECT SIGNIFICANT BENDS IN A STREAM AND PREVENT DOWNCUTTING.

Why use hydraulic structures?

Hydraulic structures help to mitigate erosion in restored streams. They prevent bank erosion by redirecting and slowing down flowing water and prevent downcutting by creating a hard point in the stream bed. Structures provide immediate stability, giving riparian vegetation a chance to establish, and can help to provide a diverse habitat within the stream by establishing pools, runs and riffles.

The Sleepy Hollow stream restoration may utilize modified cross vanes and toe rock/log protection.

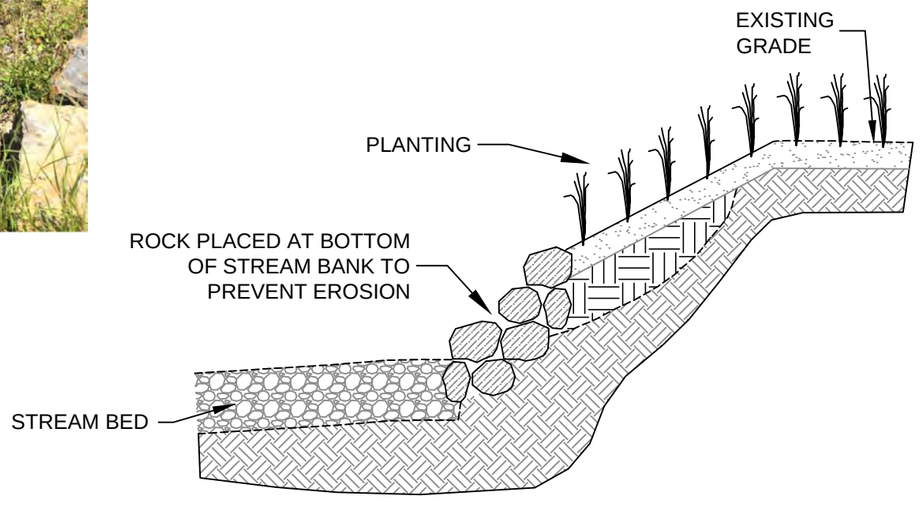
TOE LOG PROTECTION



CROSS SECTIONAL VIEW

TOE ROCK IN A RESTORED STREAM

TOE ROCK PROTECTION



CROSS SECTIONAL VIEW

HYDRAULIC STRUCTURES

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TOE ROCK AND LOG PROTECTION INVOLVES PLACEMENT OF BOULDERS OR LOGS AT THE BOTTOM OF A STREAM BANK. THIS HELPS TO MITIGATE BANK EROSION BY PROVIDING A HARD NON-ERODIBLE SURFACE AT THE PORTION OF THE BANK WHERE EROSIVE FORCES TYPICALLY OCCUR.

DEPICTION OF POST RESTORATION PLANTING

RENDERING OF RESTORED CHANNEL WITH MODIFIED CROSS VANE AND DENSE RIPARIAN PLANTING.

RENDERING OF RESTORED CHANNEL WITH MODIFIED CROSS VANE AND PLANTING OF VARIOUS RIPARIAN TREES, INCLUDING FLOWERING DOGWOOD.

RIPARIAN PLANTING

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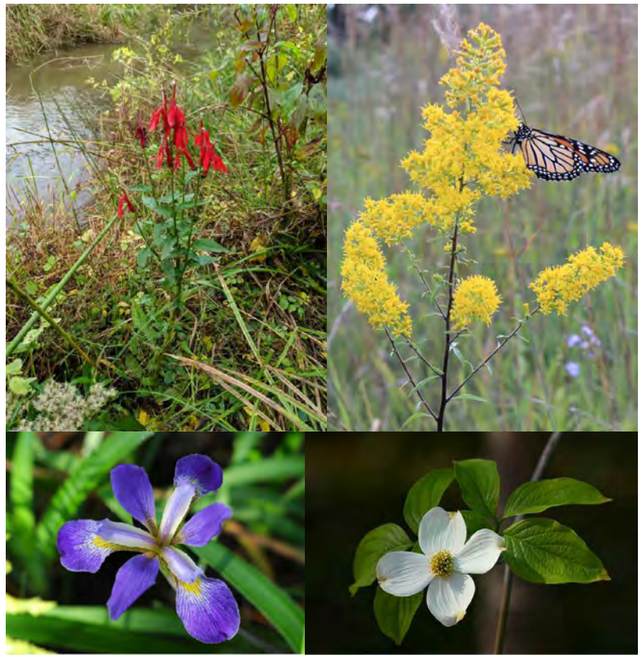

CLOCKWISE STARTING IN THE UPPER LEFT: CARDINAL FLOWER, SHOWY GOLDENROD, FLOWERING DOGWOOD AND VIRGINIA IRIS.

WEST FORK INDIAN CREEK IN FLOYD, VIRGINIA. TWO YEARS POST RESTORATION. PLANTING INCLUDES ALDER AND BONESET.

Why is planting important for stream health?

Re-vegetation, along with the use of hydraulic structures, helps to prevent future erosion and maintain channel stability. A mix of various riparian species also promotes animal diversity and boosts the overall health of the riparian ecosystem by providing both shelter and food sources. Not to mention, a quality riparian planting plan will provide flowering herbaceous plants, shrubs and trees throughout the growing season!

COMMON RIPARIAN PLANTINGS

SPECIES	CATEGORY	TIME OF YEAR FLOWERING
AGRIMONIA PARVIFLORA (HARVESTLICE)	HERBACEOUS	SUMMER
ANEMONE VIRGINIANA (THIMBLEWEED)	HERBACEOUS	SPRING/SUMMER
BIDENS FRONDOSA (BEGGAR TICKS)	HERBACEOUS	SUMMER/ FALL
CHAMAECRISTA NICITANS (SENSITIVE PARTRIDGE PEA)	HERBACEOUS	SUMMER
CLEMATIS VIRGINIANA (VIRGIN'S BOWER)	HERBACEOUS	SUMMER
DICHANTHELIUM CLANDESTINUM (DEER TONGUE GRASS)	HERBACEOUS	N/A
EUPATORIUM PERFOLIATUM (COMMON BONESET)	HERBACEOUS	SUMMER/FALL
GEUM CANADENSE (WHITE AVENS)	HERBACEOUS	SPRING
JUNCUS TENUIS (PATH RUSH)	HERBACEOUS	N/A
PARTHENOCISSUS QUINQUEFOLIA (VIRGINIA CREEPER)	HERBACEOUS	N/A
PENSTEMON DIGITALIS (PENSTEMON)	HERBACEOUS	SUMMER
SENNA HEBECARPA (WILD SENNA)	HERBACEOUS	SUMMER
SOLIDAGO SPECIOSA (SHOWY GOLDENROD)	HERBACEOUS	FALL
VERBESINA ALTERNIFOLIA (WINGSTEM)	HERBACEOUS	SUMMER
VERNONIA NOVEBORACENSIS (NEW YORK IRONWEED)	HERBACEOUS	SUMMER/FALL
LOBELIA CARDINALIS (CARDINAL FLOWER)	HERBACEOUS	SPRING/SUMMER/FALL
IRIS VIRGINICA (VIRGINIA IRIS)	HERBACEOUS	SPRING
HAMAMELIS VIRGINIANA (WITCH HAZEL)	SHRUB	FALL
ILEX VERTICILLATA (WINTERBERRY)	SHRUB	SUMMER
RHUS GLABRA (SMOOTH SUMAC)	SHRUB	SPRING
VIBURNUM DENTATUM (SOUTHERN ARROW WOOD)	SHRUB	SPRING/ SUMMER
ALNUS SERRULATA (TAG ALDER)	SHRUB	N/A
(ARONIA ARBUTIFOLIA (RED CHOKEBERRY)	SHRUB	SPRING
SAMBUCAS CANADENSIS (COMMON ELDERBERRY)	SHRUB	SUMMER
CORNUS FLORIDA (FLOWERING DOGWOOD)	TREE	SPRING
PLATANUS OCCIDENTALIS (AMERICAN SYCAMORE)	TREE	N/A
BETULA NIGRA (RIVER BIRCH)	TREE	N/A
SALIX NIGRA (BLACK WILLOW)	TREE	N/A