

THE CAPITAL'S CORRIDOR -- FROM PURVEYOR OF GOODS TO CONSERVATION



AND PREVIEW OF GO WITH THE FLOW!



Revised Presentation for the World Canal
Conference, <https://wcc2021.org/>
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A stylized, dark brown illustration of a plant with several large, pointed leaves and a cluster of small, round berries on thin stems, positioned on the left side of the slide.

Note to Readers/Users

PLEASE NOTE: THIS PRESENTATION CONTAINS FAR MORE TEXT THAN PRESENTED. THOSE USING THIS SLIDE SET WILL HAVE EXAMPLES, LINKS, AND IMAGES AND REFERENCES OF THE THEMES PRESENTED.

Presentation Sequence

1. Preface – significance and status of biodiversity
2. Overview – ever-changing Canal
3. Introduction: our key question
4. Canal transitions:
 - A. commerce-centric travel to bio-centric conservation
 - B. canals as barriers
5. Three bio-centric themes:
 - A. Biodiversity & habitat
 - B. Landscape: connectivity or fragmentation?
 - C. Conservation: habitats, corridor, and species movement
6. Education, biodiversity and the Canals
7. Audience thoughts/reflections on key question and showing of **“Go With the Flow!”**

1. Preface: Biodiversity Assessments (2005 and 2020).

“Ecosystems, species, wild populations, local varieties and breeds of domesticated plants and animals are shrinking, deteriorating, or vanishing. The essential, interconnected web of life on Earth is getting smaller and increasingly frayed.

This loss is the direct result of human activity and constitutes a direct threat to human well-being in all regions of the world.”

Millennium Ecosystem Assessment, 2005. *Ecosystems and Human Well-being: Synthesis*. Copyright © 2005 World Resources Institute

- Up to 1 million species threatened with extinction, many within decades
- Over 500,000 of world's terrestrial species now living with insufficient habitat for long term survival
- Greater than 100% growth of urban areas since 1992
- Greater than 85% of wetlands present in 1700 have been lost by year 2000
- Among greatest threats to the environment is the progressive disappearance of biodiversity

2. Overview - Keeping the Old; Building the New



RESTORE: Fixing the nearly 200-year-old canal structures
REVITALIZE: Bringing activity and excitement back to the canal
REIMAGINE: Creating a vision for the next 200 years of the canal

Georgetown Heritage is leading the partnership effort to revitalize the canal.

Part 3. Introduction– seeking a change from a vehicle of commerce to one of nature. The key question for discussion is:



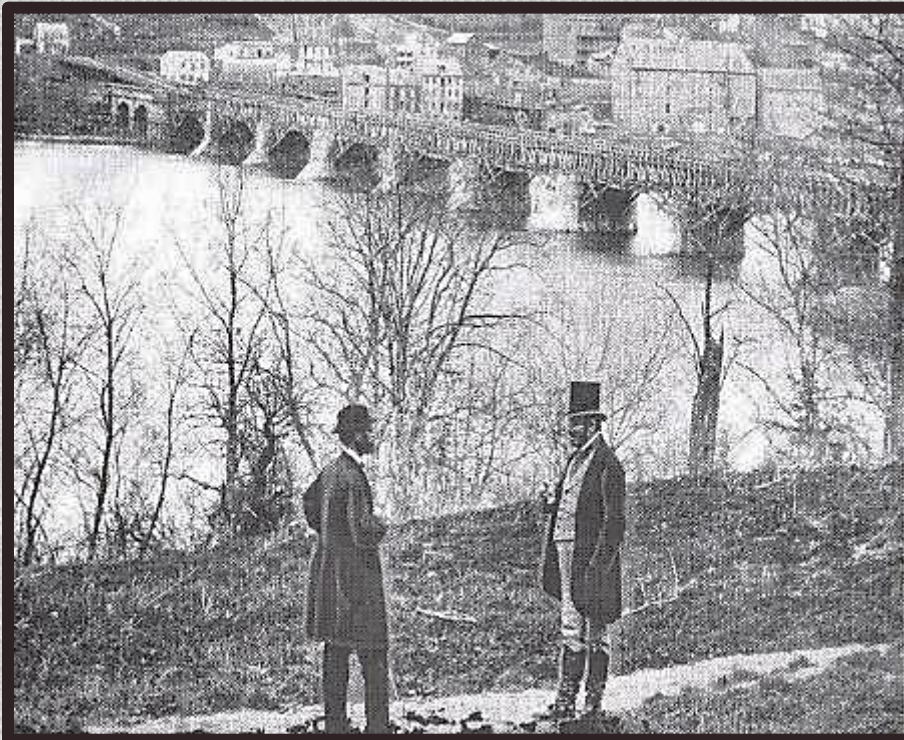
Can habitat connectivity and biodiversity become leading priorities of canal restoration?

Part 4.A. Canal Transitions – the three steps to understanding where we are today.

- **First transition (1828 to 1850):**
 - Building the Canal: digging and blasting to commercial canal next to the Potomac River
- **Second transition (1938 to 1971) :**
 - From commercial canallers to the visitors of today
 - Became part of the National Park System in 1971.
- **Third transition – where we are today (1971 to present):**
 - A place of recreation, conservation and connectivity
 - From history and recreation to connecting life.
 - *A time to think not solely about what the Canal offers you, but to consider how, as a frequent visitor, you can protect its biodiversity and ensure its function as the Capital's Corridor.*

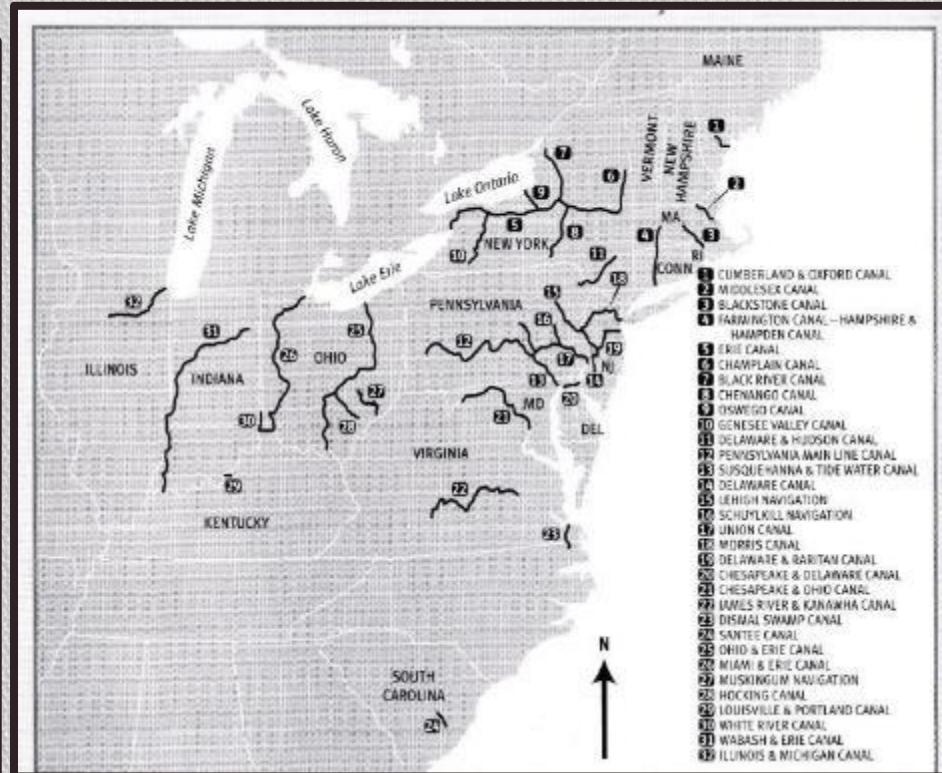
Part 4.A. First Transition (1828-1850). From nature to canal; engineering marvels: aqueducts and Paw Paw Tunnel by Chief Engineer, Benjamin Wright. Canals were part of our history.

Photo from ca 1865; looking towards Georgetown, across Potomac Aqueduct.



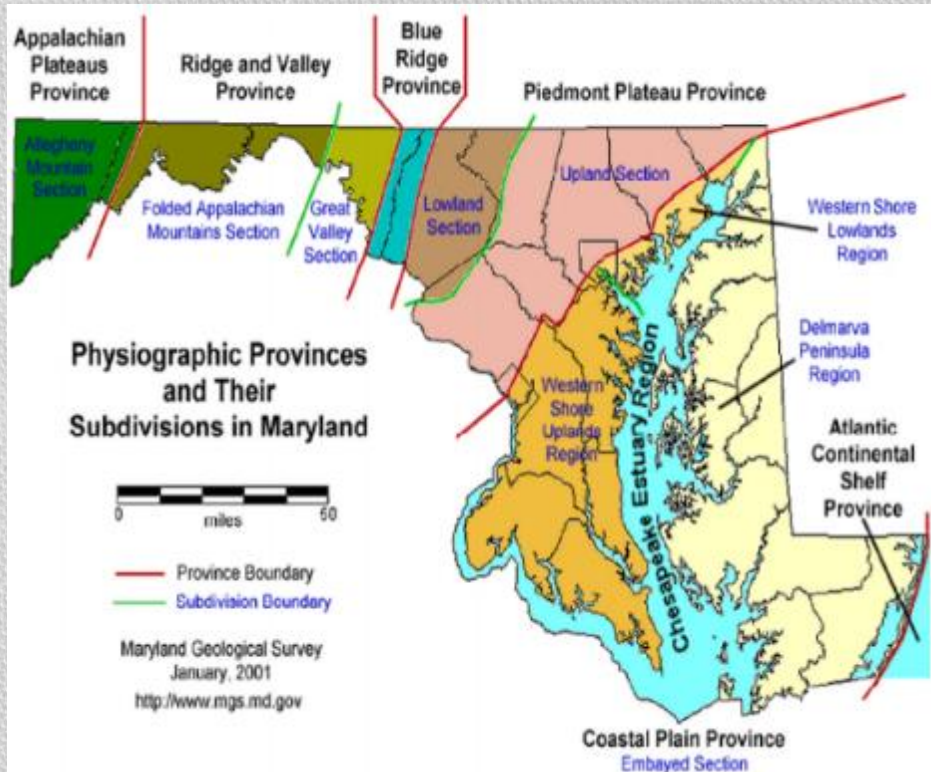
This Aqueduct carried the Alexandria Canal, a feeder canal to the main C&O Canal.

Map of principal canal and water navigations of the USA ca. 1835.



As of 1835, the number of canals here totaled 49 with a combined length of 2,617 miles.

Part 4. Second transition (1938-1971). From canal termination to national park.



National Historical Park:

President Washington and the Potomac Canal Company saw as commerce and expansion; Justice Douglas saw differently: “a refuge, a place of retreat, a long stretch of quiet and peace at the Capitals’ back door -- a wilderness area where we can commune with God and with nature...” (1954).

The “inheritance” from a transition to an Historical Park:

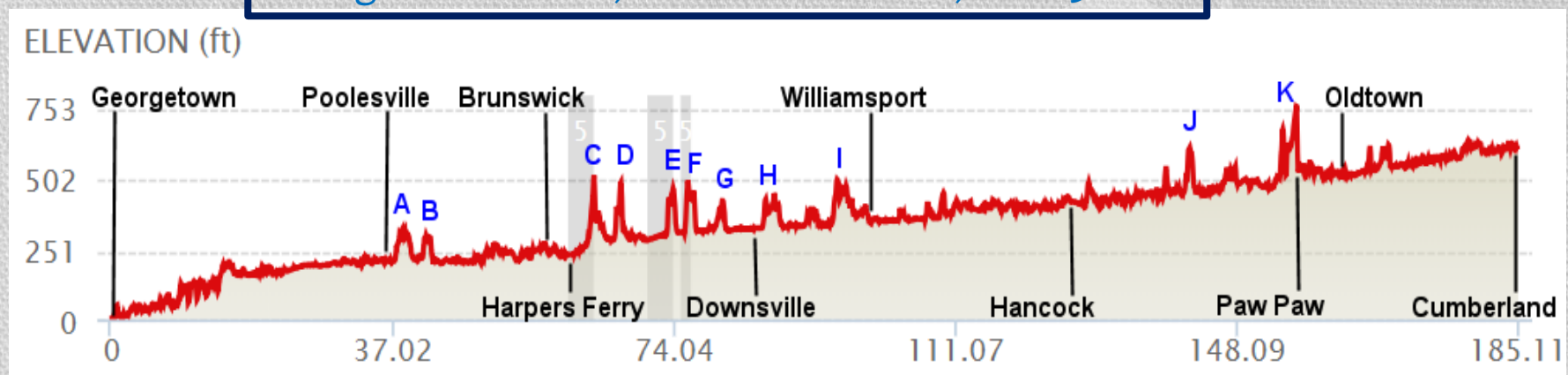
- A 155 mile stretch of greenway through intensely urban areas
- Numerous wooded areas, farmland and parks abutting perimeter
- Numerous historic artifacts, sites, and protected nature reserves/wetlands
- Traverses five Maryland physiographic provinces

Part 4. Second transition: From commerce to National Historical Park

Comparing size and elevation of National Parks and the C&O Canal

#	Name of Park	Size in acres
1	Congaree	22,000
2	C&O Canal National Historical Park	19,586
3	Indiana Dunes	15,000
4	Virgin Islands	12,909
5	American Samosa	10,520
6	Hot Springs	5,549
7	Gateway Arch	91

Change in elevation, and hence habitat, of 605 feet.



It is the river itself that creates a southerly migration of plants and animals

Part 4 A. Canal Transitions – foreseeing the canal's third transition in 1961.

Seeing the future in the past....

“A hawk streaked across Widewater. A bald eagle soared at great heights. A cardinal hopped from limb to limb in a willow oak ... All was silent, except the crunching of snow underfoot. When I stopped, I could almost hear my heart beat. Yet I was less than a dozen miles from the heart of Washington, D.C. My wilderness, though small and confined, was real.”

***Justice William O. Douglas,
My Wilderness: East to Katahdin; 1961.***

Published seven years after his walk of 1954

Part 4.A. Third transition. From Park to Corridor- Linking NPS and corridor planning

Five Parkwide Goals and Strategies from the NPS/C&O Canal Strategic Plan for 2019-2023

Goal 1: Maintain and Protect wisely: ensure towpath continuity, and protect and preserve cultural and natural resources

Strategy 4: Protect resources of special concern

Action 1. develop and implement a resource management plan that prioritizes critical natural areas and species of special concern.

(The transition to nature could occur managerially in this goal.).

Part 4. B. When canals are barriers: connectivity for C&O versus other canals as barriers



Figure 2. Canal in the Mojave Desert of California showing wildlife-proof protective fencing along the edges. Photo taken from a road across the canal.

- Canals typically barrier to wildlife movement
- Often bordered by tall chain-link fences, concrete sides,
- Often with swiftly-moving water that is often >2 m deep
- Barrier for all or almost all reptiles, mammals, and invertebrates.

Research finding from:
Toward Best Management Practices for Ecological Corridors, by Andrew Gregory, Emma Spence, Paul Beier, and Emily Garding.

Part 5.A. Biodiversity and “habitat connectivity:” the three levels of biodiversity

1. GENETIC DIVERSITY

Includes all of the differing genes (DNA) found in living organisms; this DNA is extracted, and one organism compared to another



2. SPECIES DIVERSITY

All of the different species on earth; represented by species of Namibia; most studied



3. ECOSYSTEM DIVERSITY

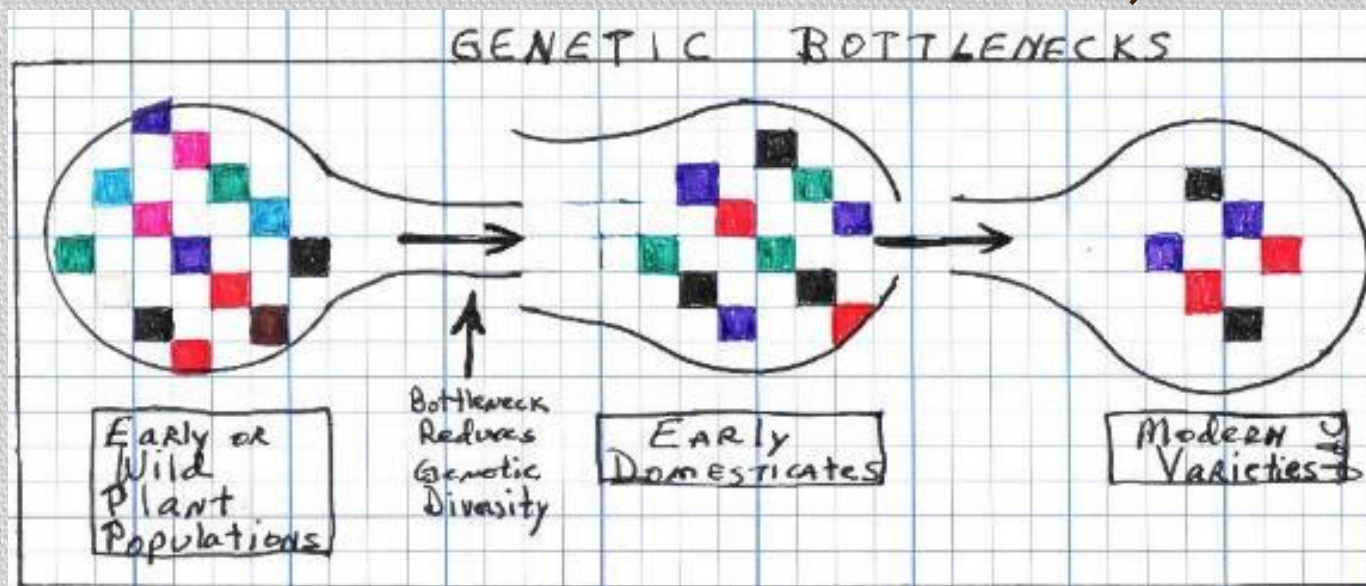
Includes all of the different habitats, ecological functions, and variation found on planet earth



The Chesapeake and Ohio Canal National Historical Park contains all three levels, however, here, we will speak of primarily genetic and species.

Part 5.A. Biodiversity, genetic diversity and genetic bottlenecks

- Movement assures matings from diverse environments
- Enriches gene pool; avoids bottlenecks
- Consequences: without movement, populations stagnate; diversity reduces, & sterility occurs



Video: cheetah genetic vulnerability

<https://www.nationalgeographic.org/video/cheetah-matchmaker/>

Part 5.A. Species Diversity

Species identified on the Canal

Kingdom	and taxa	Number
1.	Vascular plants	679*
2.	Fish	74
3.	Reptiles	21
4.	Amphibians	20
5.	Birds	181
6.	Mammals	37
7.	Total	1012

- * All data from Species Checklists *National Capital Region Network, Inventory & Monitoring, Checklist.*
- https://www.nps.gov/im/ncrn/choh.htm#CP_JUMP_5686702

Part 5.A. Biodiversity and “habitat connectivity” –

Results of Visitor Research study: *Biodiversity Attracts National Park Visitors; A Study by Pirkko Siikamaki, 2015*



Objective 1: biodiversity as predictor of # of visits to NPs

Objective 2: biodiversity and recreational use overlap in NPs

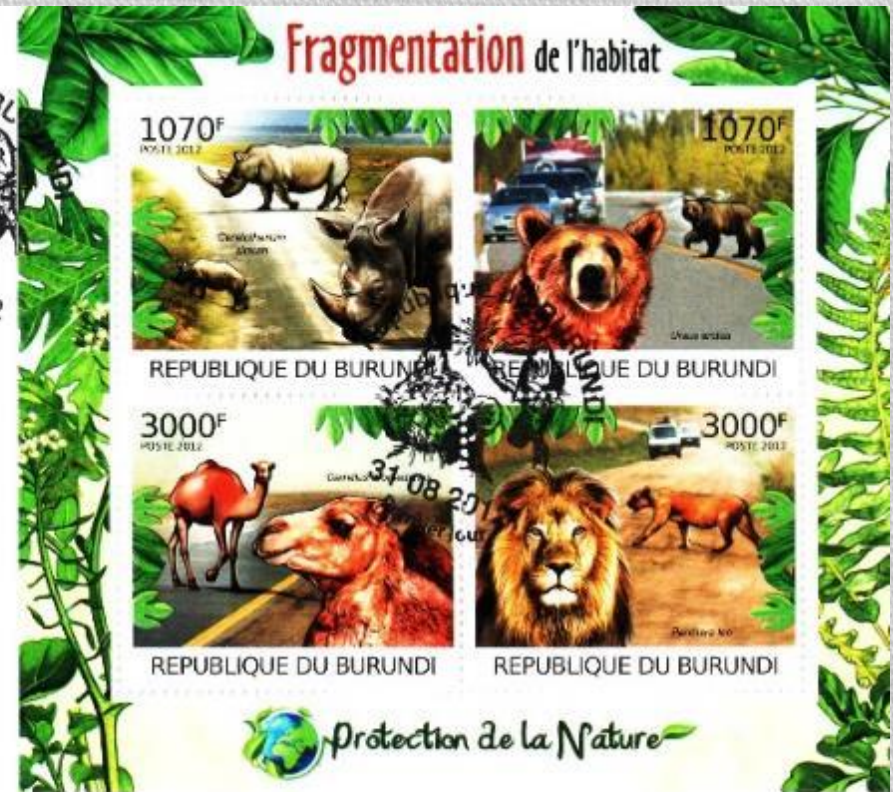
“Our study showed that biodiversity in protected area attracts people, NPs with the highest number of habitat types and the number of occurrences of threatened species acquiring the highest number of visits.

In addition, most visited sites within the NPs highly overlapped with areas of high habitat and species richness. These observed connections between biodiversity values and NP visitations gives evidence of the direct linkage between biodiversity protection and ecosystem services.”

Part 5.B. Landscape: connectivity or fragmentation?

“Human induced fragmentation can happen quickly across large areas and permanently affect biodiversity.”

Corridor Ecology; p. 67



Part 5.B. Landscape: connectivity or fragmentation?

CONNECTEDNESS AND CORRIDORS

- Habitats: locations where plant or animals grow and reproduce
- Connectivity: measure organism's movement among separated patches of habitat
- Increases landscape permeability

FRAGMENTATION

- Second example: physical features which impede movement
- Connectivity is loss during periods of fragmentation
- Decrease landscape permeability

Part 5.B. Landscape: connectivity or fragmentation?

CONNECTEDNESS AND CORRIDORS

- Networks of corridors that link isolated patches of habitat together
- Corridors: part of landscape that facilitates connectivity among isolated habitats
- Connectivity relies on corridors for linkage, and on their continuous makeup

FRAGMENTATION

- Breakup of large habitats into smaller, isolated fragments that later may or may not be connected
- Corridors are displaced or separated such that formation of fragments begins
- One example: fragmentation breaks up habitats due to invading species

5.B. National Park perimeter encroachment.

In 2004, Washington Redskins owner Dan Snyder was given permission to chop down 130 trees even though the tree-cutting request contradicted National Park Service policy



© Washington Post/Getty Images

Part 5.B. Landscape: Connectivity and Corridors:

What works and what
does the Canal offer?

“Ecological connectivity means a measure of the ability of organisms, gametes, and propagules to move among separated patches or suitable habitat.”

Meanwhile in
Florida...panthers, gators
and bears using wildlife
crossings

<https://www.youtube.com/watch?v=kMkxyXkcLBQ>

What works	What does Canal offer?
1. Confronting fragmentation head-on	184.5 miles of habitat over five zones
2. Able to monitor for species dispersal	Species data from National Capital Inventory and Monitoring Network
3. Location contains numerous, varied habitats	Habitats reported for numerous species
4. Overcome impediments to movement	??
5. Legal protection of landscape present	Granted as a National Park area since 1971
6. Area suited for landscape interventions	??
7. Free from perimeter encroachment	Difficulties have occurred

Part 5.B. Landscape

Goals and Strategies from The NPS/C&O Canal Strategic Plan for 2019-2023

Goal 1; Strategy 4: Protect resources of special concern

Action 1. develop and implement a resource management plan that prioritizes critical natural areas and species of special concern.

Translated into a plan of action for the NPS including:

- 1) aquatic habitats and resources,**
- 2) rare, threatened, and endangered species and communities,**
- 3) forest habitats and resources, and**
- 4) habitat connectivity.**

Part 5.B. Landscape Planning: benefits for us?

- Source of “local biodiversity” which can be used educationally in numerous venues and schools
- New corridors offer new “open space” for hiking, etc.
- Protecting/enhancing and joining up to developments with desirable “green space;” ecosystem services

- Join with local greenspace neighborhood networks
Example here from Mt. Rainier, MD



- Help control erosion and other soil- related declines
- Increase insect pollination by harboring flowers/bees
- Providing for sports requiring lengthy areas (riding)

Part 5.B. Landscape Planning:

Are there benefits from nature?

Chesapeake & Ohio Canal National Historical Park Visitor Study
Summer 2003 Visitor Services Project (VSP) Report 145 May 2004

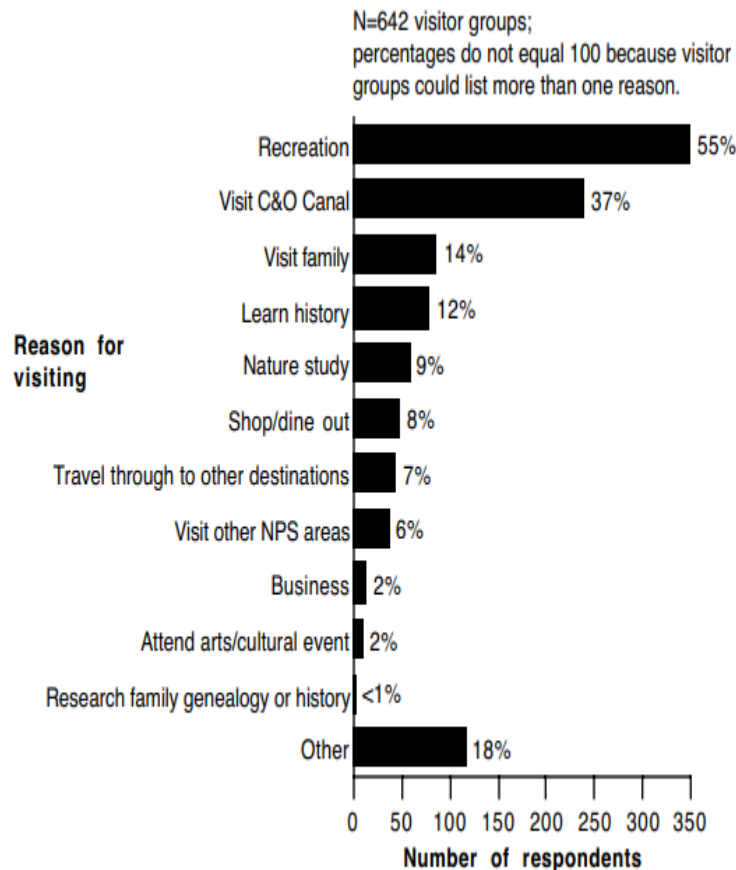


Figure 21: Reasons for visiting C&O Canal NHP area

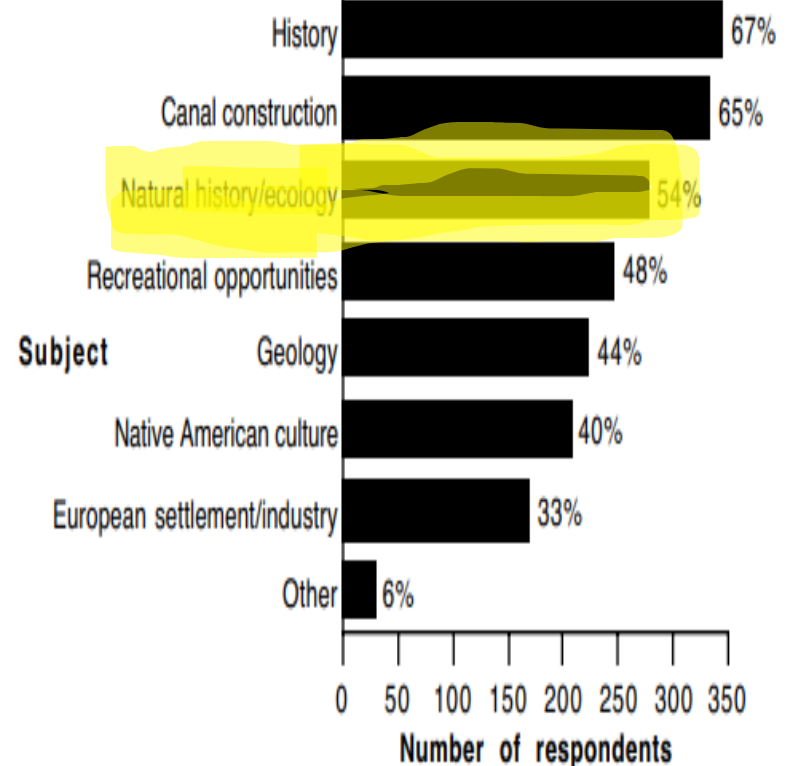


Figure 98: Preferred subjects of interest on a future visit to C&O Canal NHP

Part 5.C. Conservation. Comparing function and structure of the C&O Canal for Wildlife

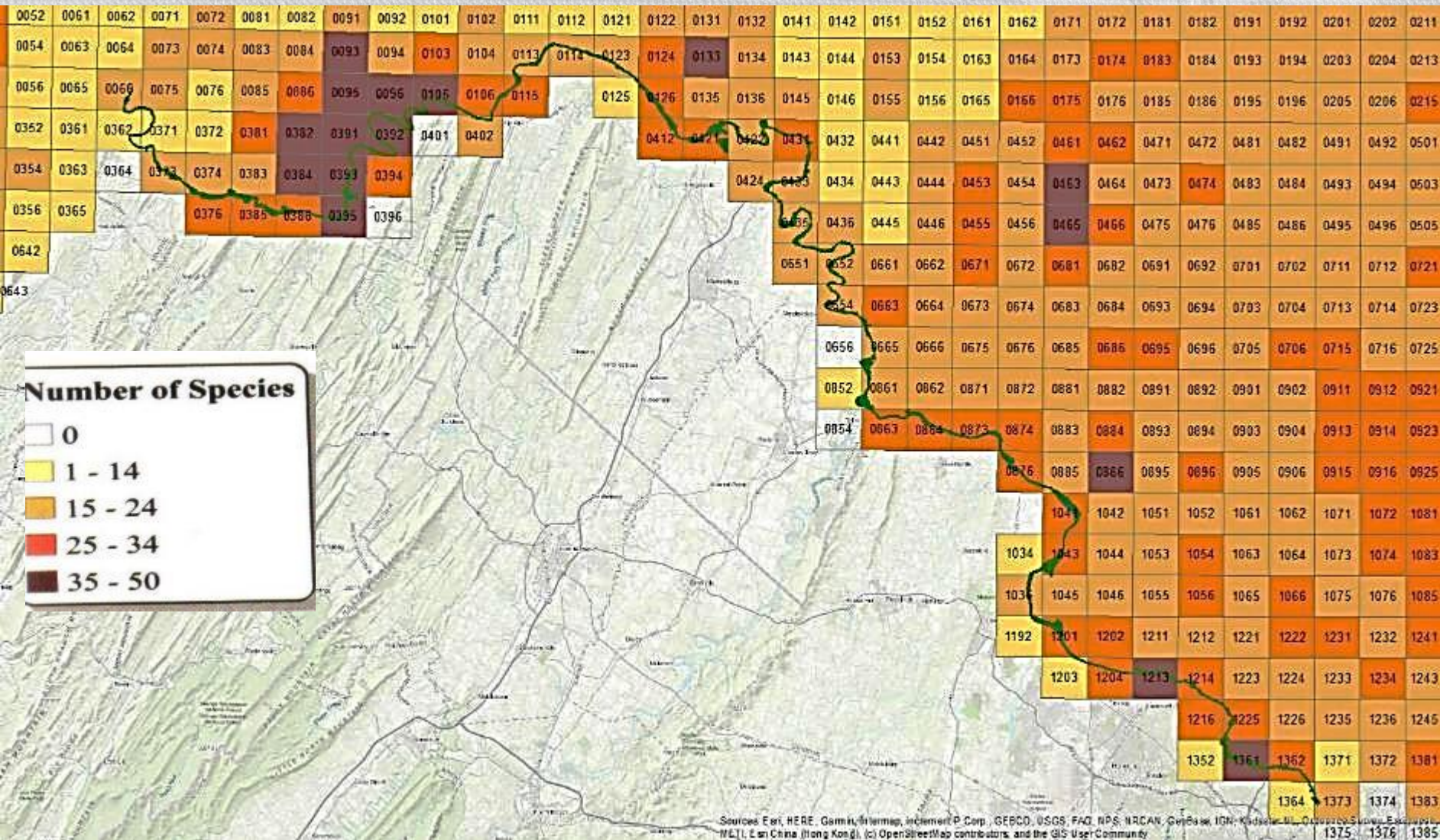
Functional: evidence of movement

1. Original elements comprising Canal not built for connectivity, but fulfil corridor's purpose
2. Does evidence indicate that the Canal facilitates specific species movement?
3. Commuting corridor – linked habitats that support daily movement including breeding, resting, foraging

Structural: physical features

1. 184.5 miles of more/less contiguous distance over five physiographic provinces: Atlantic coastal plain to Appalachian Plateau.
2. Other physical features presumed important for organisms to traverse Canal
 - Example: canal bed = breeding habitat for amphibians
 - Aqueducts: crossing feeder/river entrances

Part 5.C. Example: Herpetology richness for C&O National Historical Park, 2018



Part 6. Education, Biodiversity and the Canal

Students who demonstrate understanding can: HS-LS2-7. **Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. Next Generation Science Standards (NGSS)**

Science and Engineering

Practices

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Disciplinary Core Ideas

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species.

LS4.D: Biodiversity and Humans

- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (secondary)
- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (secondary) (Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.)

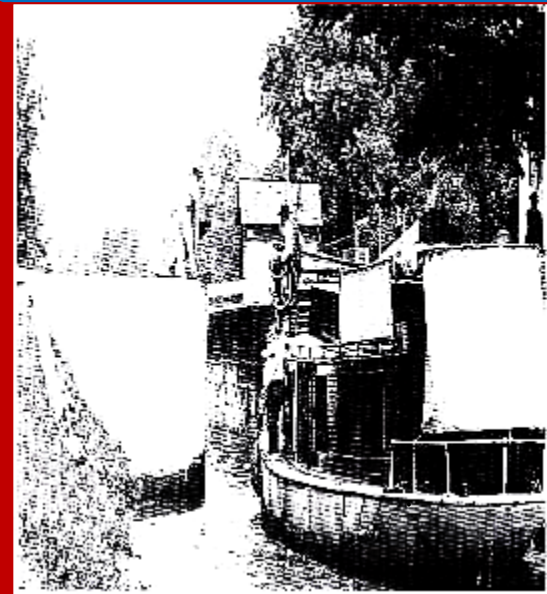
ETS1.B: Developing Possible Solutions

- When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. (secondary)

Part 7. Audience -- Conclusions and Summary

So, what is the canal today and in the future?

C&O in the past



a canal of hard work,
sacrifice, commerce,
and closure

C&O in the present –a
canal graced with
history, integrity and
popularity



C&O in the future –
what started as a corridor
by accident provides
connectivity between
habitats to be enjoyed by
people and wildlife



1. Conduct audience viewpoints
2. Video, *“Go With the Flow”*

THE CAPITAL'S CORRIDOR -- FROM PURVEYOR OF GOODS TO CONSERVATION

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