



Metropolitan Washington
Council of Governments

BGI PROJECT TYPES - CO-BENEFITS & RELATIVE FEASIBILITY

WWW.MWCOG.ORG/BGI

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BGI Project Types

PROJECT TYPE

Definition and purpose of the project type.

Co-Benefits

This box details the major co-benefits associated with each resilience solution. Each solution is targeted at addressing a specific hazard (i.e., flooding, heat, or extreme storms). But these solutions also can lead to good outcomes beyond the specific climate hazard it targets. These additional good outcomes are known as co-benefits.

For example, planting trees can help prevent flooding. Their roots reach deep into the soil and make it easier for water to absorb more quickly into the ground. But trees also purify the air, and this benefits the health of the whole community. Therefore, we say that public health is a co-benefit of tree planting.

Relative Project Details

The dark blue box to the left provides a quick, high-level guide to understanding the relative level of effort (low, medium, or high) required for each of these resilience solutions.

- **TIMELINE:** The relative time it may take to implement this solution.
- **COST:** The relative cost of implementing of this solution.
- **FOOTPRINT:** The relative amount of space the solution takes up.
- **HAZARD REDUCTION:** How effective the solution might be at addressing the climate hazard of interest, relative to the other solution types.

The specific values associated with each of these metrics (actual cost, timeline, etc.) will be project, circumstance, and community dependent.

TIMELINE

LOW MED HIGH

COST

LOW MED HIGH

FOOTPRINT

LOW MED HIGH

HAZARD REDUCTION

LOW MED HIGH

Note: Project details refer to one installment of the solution.

TREE PLANTING

Trees serve an important role in flood management. Their branches and leaves intercept and hold rain, allowing it to evaporate. Their roots absorb water and reduce erosion during storms. In forested areas, decomposing leaves generate high-quality soils that absorb water. Tree planting impacts communities on small and large scales, such as street trees or establishing new forests.

TIMELINE

LOW MED HIGH

COST

LOW MED HIGH

FOOTPRINT

LOW MED HIGH

HAZARD REDUCTION

LOW MED HIGH

Note: Project details refer to one installment of the solution.



Flood Mitigation

Reduce runoff rates by capturing some rainfall in tree canopy, which slows down rain as it falls to the surface, and by providing green space where water can infiltrate.



Social Equity

Provide shade to reduce extreme heat, the financial burden of cooling homes, and the potential health risks associated with heat waves.



Public Health

Provide air quality benefits and shade to reduce health risks associated with extreme heat (i.e., cardiovascular and respiratory illness).



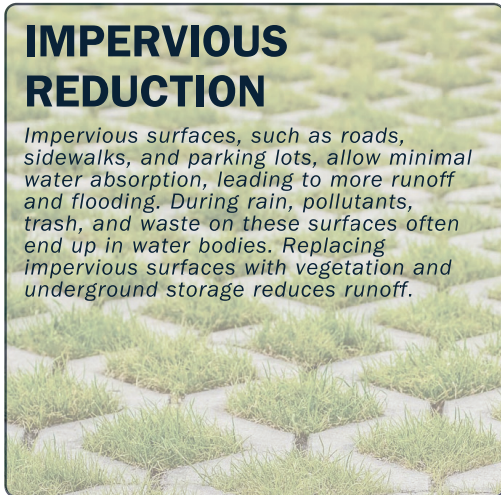
Sustainable Development

Encourage growth that balances economic, social and environmental well-being for existing and new residents.

BGI Project Types

IMPERVIOUS REDUCTION

Impervious surfaces, such as roads, sidewalks, and parking lots, allow minimal water absorption, leading to more runoff and flooding. During rain, pollutants, trash, and waste on these surfaces often end up in water bodies. Replacing impervious surfaces with vegetation and underground storage reduces runoff.



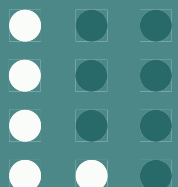
TIMELINE

LOW MED HIGH

COST

FOOTPRINT

HAZARD REDUCTION



Note: Project details refer to one installment of the solution.



Flood Mitigation

Reduce urban flooding by providing a porous surface for water to infiltrate, strategically placed in low-lying areas where runoff accumulates.



Sustainable Development

Encourage growth that balances economic, social, and environmental well-being for existing and new residents.



Public Health

Decrease concrete surfaces that absorb and retain heat, reducing extreme temperatures in urban heat islands.



Soil Stabilization

Reduce peak runoff rate to preserve the local landscape and minimize soil accumulation that clogs stormwater infrastructure.

STORMWATER REUSE & STORAGE

Stormwater reuse and storage involve capturing and storing rainwater runoff for uses like irrigation, cooling, and replenishing groundwater. This method reduces strain on stormwater systems, mitigates flooding, and conserves water resources through techniques like rainwater harvesting, and retention basins.



TIMELINE

LOW MED HIGH

COST

FOOTPRINT

HAZARD REDUCTION



Note: Project details refer to one installment of the solution.



Flood Mitigation

Reduce runoff rates or temporarily store stormwater during very heavy rainfall periods. This water slowly drains to prevent flooding.



Water Quality

Filter pollutants and sediment from stormwater runoff. This improves water quality, benefiting the ecosystem and community as a whole.



Public Health

Improve water quality to reduce exposure to pollutants and support public health as a result. Retention basins also can beautify community spaces which can benefit residents' mental health.



Biodiversity

Enhance water quality and provide habitats that support a wide array of native plant and animal species.

BGI Project Types

GREEN STORMWATER INFRASTRUCTURE

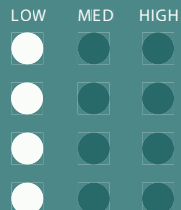
GSI uses nature-based methods to store and treat stormwater close to where it falls. Examples include rain gardens, green roofs, bioswales, and permeable pavement. It's also called Low Impact Development (LID) or Best Management Practice (BMP).

TIMELINE

COST

FOOTPRINT

HAZARD REDUCTION



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Flood Mitigation

Reduce urban flooding by providing a porous surface for water to infiltrate, strategically placed in low-lying areas where runoff accumulates.



Sustainable Development

Encourage growth that balances economic, social, and environmental well-being for existing and new residents.



Public Health

Improve water quality to reduce exposure to pollutants and support public health as a result. Green infrastructure also can beautify community spaces which can benefit residents' mental health.



Soil Stabilization

Reduce peak runoff rate to preserve the local landscape and minimize soil accumulation that clogs stormwater infrastructure.

STREAM, WETLAND, & FLOODPLAIN RESTORATION

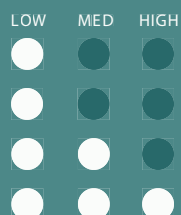
Water runoff concentrates in valleys and streams, increasing the flood risk in low-lying areas near rivers, known as the "floodplain." In developed regions, infrastructure often lies within floodplains. Reconfiguring floodplains improves water storage and flow, typically involving resilient, native landscaping like wetlands and forests.

TIMELINE

COST

FOOTPRINT

HAZARD REDUCTION



Note: Project details refer to one installment of the solution.



Flood Mitigation

Reduce urban flooding by providing surface areas for storage, strategically placed in low-lying areas where runoff accumulates.



Biodiversity

By enhancing water quality and vegetation, these detention areas provide habitats that can support a wide array of native plant and animal species to improve local biodiversity.



Public Health

Improve water quality to reduce exposure to pollutants and support public health as a result. Stream, wetland, and floodplain restoration also can beautify community spaces which can benefit residents' mental health.



Water Quality

Filter pollutants and sediment from stormwater runoff. This improves water quality, benefiting the ecosystem and community as a whole.

BGI Project Types

STORM DRAIN OUTFALL RETROFITS

In urban areas, stormwater exits drainage systems at "outfalls," which flow into ditches or streams near property boundaries. These outfalls are ideal for stormwater storage before reaching floodplains. Projects could include ponds, step-pool systems, or LID practices to slow and store runoff.



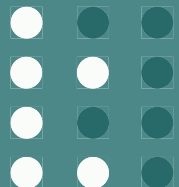
TIMELINE

LOW MED HIGH

COST

FOOTPRINT

HAZARD REDUCTION



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Flood Mitigation

Outfalls temporarily store stormwater during very heavy rainfall periods. This water slowly drains following the intense storm event to prevent flooding.



Water Quality

Outfalls filter pollutants and sediment from stormwater runoff. This improves water quality, benefiting the ecosystem and community as a whole.



Public Health

Improve water quality to reduce exposure to pollutants and support public health as a result. Beautify community spaces which benefits resident mental health.



Biodiversity

By enhancing water quality, provide habitats that can support a wide array of native plant and animal species to improve local biodiversity.

POND RETROFIT

Stormwater ponds store and treat stormwater runoff. Existing facilities can often be modified to improve performance, function, and beauty. Depending on location and preference, ponds can take many forms, including dry, wet, and wetland ponds.



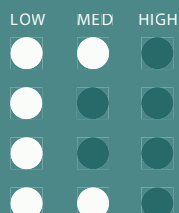
TIMELINE

LOW MED HIGH

COST

FOOTPRINT

HAZARD REDUCTION



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Flood Mitigation

Detention ponds temporarily store storm water during very heavy rainfall periods. This water slowly drains following the intense storm event to prevent flooding.



Water Quality

Filter pollutants and sediment from stormwater runoff. This improves water quality, benefiting the ecosystem and community as a whole.



Public Health

Improve water quality to reduce exposure to pollutants and support public health as a result. These ponds also beautify community spaces and can benefit resident mental health.



Soil Stabilization

Reduce peak runoff rate to preserve the local landscape and minimize soil accumulation that clogs infrastructure.

BGI Project Types

STREAM DAYLIGHTING

Gray infrastructure systems are often limited by the capacity of underground pipes, causing upstream flooding. Stream Daylighting refers to restoring underground pipe networks to the surface as "blue" drainage amenities or streams. The daylighting of surface streams in floodable areas increases the drainage network's capacity to store and convey water.

TIMELINE

COST

FOOTPRINT

HAZARD REDUCTION

LOW MED HIGH



Note: Project details refer to one installment of the solution.



Flood Mitigation

Upgrade existing infrastructure to improve local conveyance capacity, mitigate bottlenecks, and reduce flooding.



Sustainable Development

Reduce flooding and the financial, health, and lifestyle burden it can have, particularly for vulnerable populations.



Public Health

Improve water quality to reduce exposure to pollutants and supports public health as a result. It also beautifies community spaces, benefiting residents' mental health.



Soil Stabilization

Reduce peak discharges at pipe outlets to preserve the local landscape and minimize soil accumulation that clogs stormwater infrastructure.

BLUE-GREEN STREETS

Blue-Green Streets divert stormwater from streets and parking lots into GSI practices, like bioretention areas and permeable pavement, to control floods and support native plants. Roads can also be redesigned to convey and detain larger amounts of water.

TIMELINE

COST

FOOTPRINT

HAZARD REDUCTION

LOW MED HIGH



Note: Project details refer to one installment of the solution.



Flood Mitigation

Reduce urban flooding by providing a porous surface for water to infiltrate, strategically placed in low-lying areas where runoff accumulates.



Social Equity

Reduce flooding and the financial, health, and lifestyle burden it can have, particularly for vulnerable populations.



Public Health

Decrease concrete surfaces that absorb and retain heat, reducing extreme temperatures in urban heat islands.



Water Quality

Filter pollutants and sediment from stormwater runoff. This improves water quality, benefiting the ecosystem and community as a whole.

BGI Project Types

MULTI-PURPOSE FLOODABLE RECREATIONAL SPACES

Floodable public spaces, like parks, plazas, and athletic fields can store and release floodwater during extreme events, while serving as community areas when dry. Athletic fields, for example, can improve drainage for regular use and provide overflow storage during floods, reducing downstream risks.

TIMELINE



COST



FOOTPRINT



HAZARD REDUCTION



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Flood Mitigation

Reduce urban flooding by providing a porous surface for water to infiltrate, strategically placed in low-lying areas where runoff accumulates.



Economic Revitalization

Beautify the community and increase functional green space that attracts visitors and residents alike.



Social Equity

Reduce flooding and the financial, health, and lifestyle burden it can have, particularly for vulnerable populations.



Public Health

Decrease concrete surfaces that absorb and retain heat, reducing extreme temperatures in urban heat islands.

BRIDGE & CULVERT MODIFICATION

Bridges and culverts create "pinch-points" in floodplains, increasing flood risks. Many were built before watersheds expanded and may now be undersized. Modifying them can improve flood timing, storage, and flow.

TIMELINE



COST



FOOTPRINT



HAZARD REDUCTION



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Flood Mitigation

Upgrade existing infrastructure to improve local conveyance capacity, mitigate bottlenecks, and reduce flooding.



Soil Stabilization

Reduce peak discharges at pipe outlets to preserve the local landscape and minimize soil accumulation that clogs stormwater infrastructure.



Public Health

Alleviate exposure to contaminated floodwaters and waterborne illness and reduce mosquito breeding by preventing standing water.



Social Equity

Reduce flooding and the financial, health, and lifestyle burden it can have, particularly for vulnerable populations.

Relative Feasibility of BGI Projects

