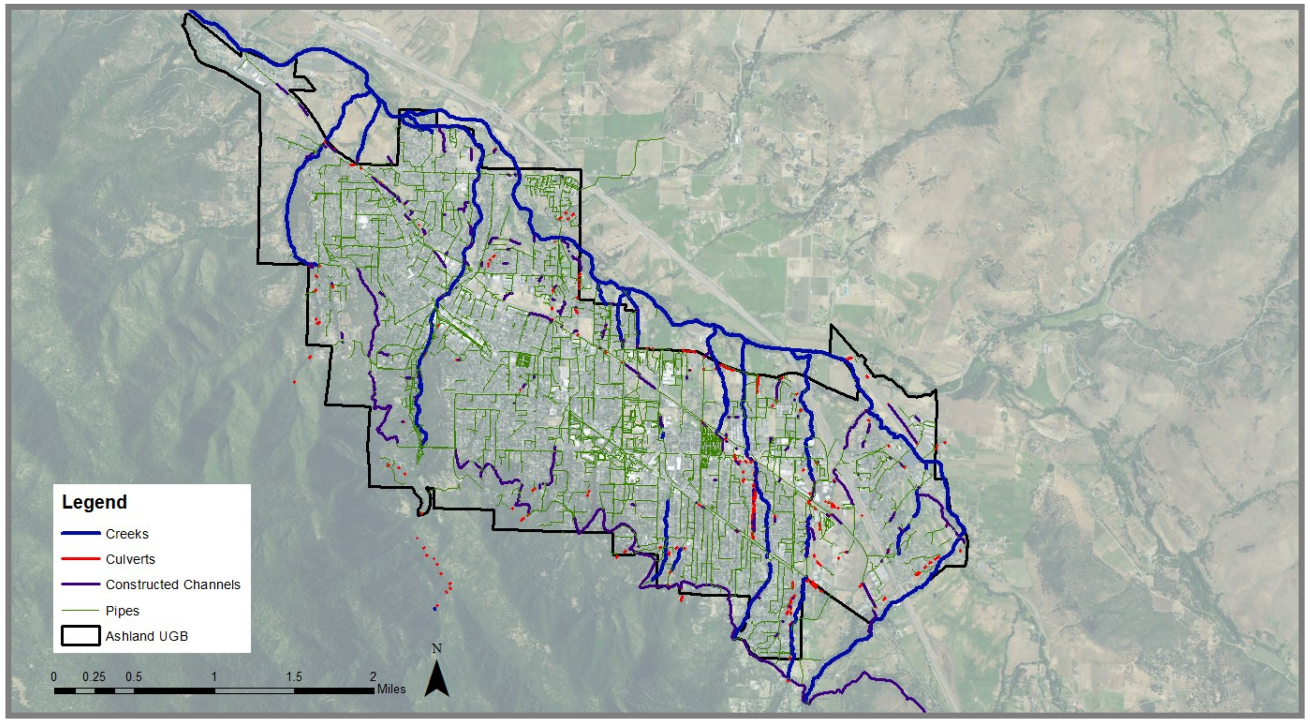
Surface Water Conveyance

In nature, surface water moves along a network of waterways: brooks, creeks, streams, and rivers. Generally speaking, these systems consist of a channel, banks, a flood way, and a flood plain. Water from rain events, snow and ice melt, and natural springs is collected and conveyed naturally according to the laws of hydrodynamics. Without human intervention, these systems can work to efficiently move water across the landscape. In addition, natural water conveyance systems provide additional ecosystem service benefits such as improved water quality, sediment conveyance, floodwater storage, and habitat.

Increasing attention has been turned to placing all water conveyance decisions within a watershed context as localized flood control measures, such as concrete channelization in a neighborhood, can result in increased flood risk downstream.



TAKEAWAY

Ashland is a hillside community located in the upper portion of the Ashland Creek Watershed. Numerous first to third order streams convey water from above, and through, Ashland to Bear Creek at the base of the watershed. LID techniques may be used to mitigate localized flooding within the city, while GI approaches along Bear Creek would have greater flood reduction benefits to downstream communities.

NHMP Benefits

Surface water conveyance can help to mitigate the number and severity of localized and downstream flood events.

- Minimizing and slowing overland stormwater flow by supporting soil and vegetation infiltration and roughness reduces the speed and rate of stormwater delivered to waterways and stormwater infrastructure.
- Decreasing the amount of runoff that reaches streams can keep stream flow rates within the stream channels conveyance capacity and prevent downstream flood events.
- Waterways are more resilient alternatives to hardened infrastructure such as pipes and culverts that are more susceptible to failure during flood and earthquake events.

GI/LID Best Management

Reducing the watershed's susceptibility to flood events is goal of GI and LID best management practices for water conveyance.

- Urban stream daylighting, the practice of uncovering some or all of a previously covered waterway, can increase the watershed's resilience to flood events.
- Channel stabilization, channel enlargement, bank protection, and river diversion techniques are GI approaches to preserving and enhancing stream channel conveyance.
- There are many LID tools for reducing urban impacts on water conveyance to reduce a stream channel's risk of flooding such as water conveyance swales, rain gardens, soakage trenches, vegetated rooftops, rain barrels, permeable pavement, and removal of impervious surfaces.

NHMP Actions

Possible NHMP action items to support the ecosystem service of surface water conveyance include:

- Increasing vegetation along stream channels to reduce sedimentation, mitigate bank erosion, and maintain channel width and conveyance capacity.
- Increase pervious surfaces and reduce impervious surfaces in areas of developed areas to reduce runoff and increase infiltration and absorption.
- Plan GI projects in concentrated conveyance areas to detain, or slow the flow of water into Bear Creek and Ashland Creek during periods of heavy precipitation and peak flow.

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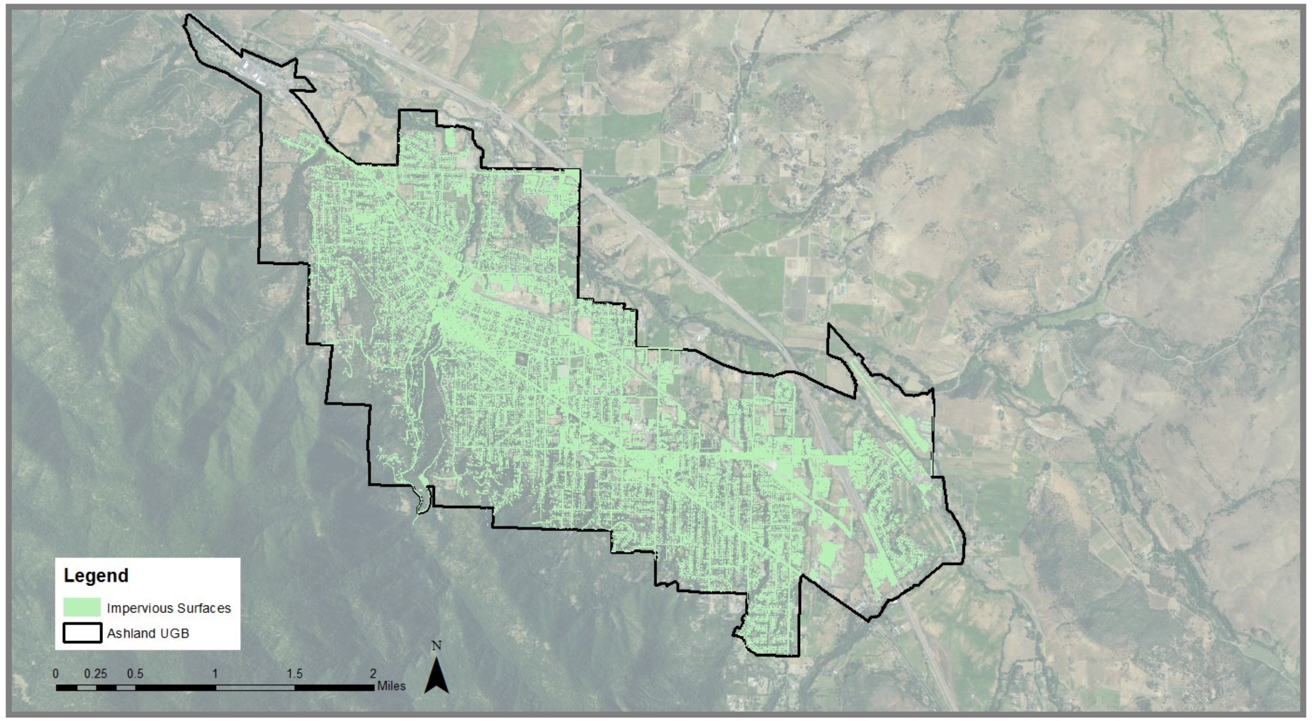
Stormwater Infiltration

In predevelopment conditions, a significant portion of precipitation is intercepted by vegetation and evaporated while the limited rainfall that does reach the ground can be absorbed by pervious soils. Without human caused soil compaction, impervious surface coverage, and reduction of vegetation, stormwater can infiltrate resulting in minimal surface runoff and increased groundwater recharge. Stormwater infiltration is important for sustaining a healthy water table that that sustains streamflow during summer and fall months and after periods of low precipitation. Infiltration further provides natural filtration that improves water quality.

While soil infiltration rates vary based on soil type and topography, in general human development decreases stormwater infiltration across a watershed due to an increase in impervious surfaces and compaction of porous soils.



TAKEAWAY

Ashland is a largely developed within its urban growth boundary (UGB) and there has a been a significant reduction in infiltration resulting in an increased risk of flooding. GI and LID best management practices can be used to increase infiltration and reduce localized flooding within Ashland. A reduction in runoff that reaches Bear Creek will further help to mitigate the number and severity of downstream floods.

NHMP Benefits

Stormwater infiltration can help to mitigate the number and severity of localized and downstream flood events while also contributing to a sustained water supply during periods of drought.

- By infiltrating stormwater, overland flow is reduced and the speed and rate of stormwater delivered to waterways and stormwater infrastructure is minimized.
- A reduction in runoff above steep slopes can help to prevent the saturation of soils that is a primary factor in triggering landslides.
- Reducing overall runoff by increasing stormwater infiltration in a watershed can mitigate flash flooding during high volume rain events.

GI/LID Best Management

Reducing the watershed's susceptibility to flood events is the goal of GI and LID best management practices for stormwater infiltration.

- Amended soils, urban trees, rain gardens, bioswales, stormwater planters, infiltration basins, and pervious pavers, pavement, and asphalt are all LID best management practices supporting stormwater infiltration.
- Wetland restoration, constructed wetlands, and dry and wet detention basins are all GI best management practices for supporting stormwater infiltration.
- To minimize the impact of development, new development can be required to maintain stormwater infiltration and not increase the overland flow from the site.

NHMP Actions

Possible NHMP action items to support the ecosystem service of stormwater infiltration include:

- The use of LID best management practices (BMPs) within the city right of way can reduce runoff from city streets and parking lots. Retrofitting LID BMPs can be accomplished during routine street maintenance or as part of a targeted "green streets" program.
- Incentives could be used to encourage private landowners to implement LID BMPs that increase stormwater infiltration.
- GI projects can be designed to increase infiltration and reduce stormwater runoff into Ashland and Bear Creek.

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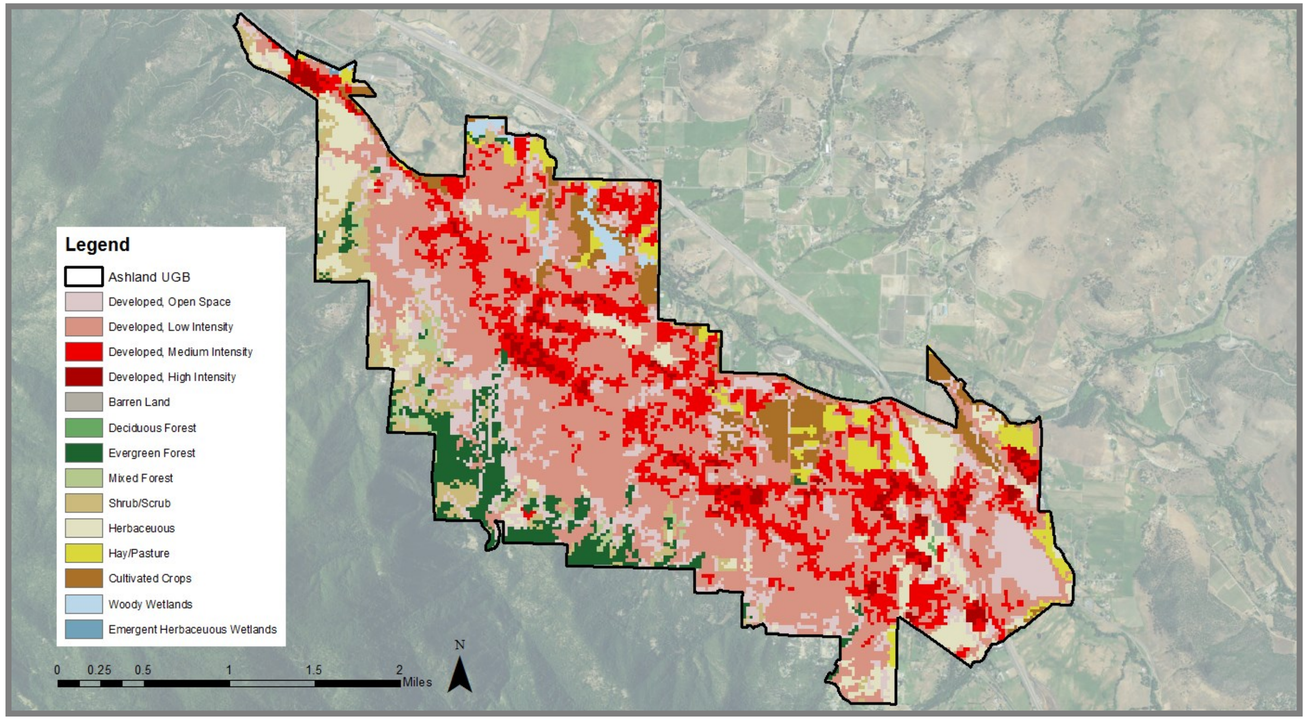
Sediment Retention

In natural systems, sediment retention occurs via vegetated land and streambanks that control both the rate of sediment creation and slow surface water flow allowing sediment to settle out prior to entering stream channels. Development can disrupt these natural sediment retention systems by removing vegetative cover and increasing surface flow rates. This can lead to increased sediment deposition in stream channels that can accrue faster than it can be flushed down stream. Large amounts of sediment build up, or channel deposits, can cause stream channels to expand or branch away from the buildup, decreasing their water conveyance capacity and increasing channel flood risk. Similarly, increased sedimentation impacts the water quality of streams, lowering habit quality of stream segments. In addition, sediment that builds up behind dams can cause a dam breech during a flood event, aggregating the extent of flood damage.



TAKEAWAY

Ashland has a large number of surface water conveyance structures, both natural and built, that are susceptible to sedimentation that can increase flood risk. GI and LID best management practices can be used to decrease sediment creation and to prevent sediment from reaching the surface water conveyances structures. Maintaining sediment further protects stabilizing steep slope vegetation.

NHMP Benefits

Sediment retention can help to mitigate the number and severity of localized and downstream flood events.

- By minimizing the rate that sediment is created and deposited, the capacity of waterways to transport stormwater is maintained and the risk of flooding is not increased.
- Maintaining vegetative cover on steep slopes prevents the release of sediment in landslide events.
- Preventing the buildup of sediment behind dams maintains the dam capacity and mitigates flood effects and risks.
- Sediment accrual in hardened and piped water infrastructure decreases the stormwater infrastructure capacity and can contribute to localized flooding.

GI/LID Best Management

Reducing the watershed's susceptibility to flood events is goal of GI and LID best management practices for sediment retention.

- Soakage trenches, bioswales, vegetated filter strips, and tree protection and planting are all LID best management practices for increasing sediment retention by decreasing sediment creation and decreasing surface water flow rates allowing sediment to fall out prior to reaching surface water conveyance structures.
- Constructed wetlands, restored and connected floodplains, and vegetated stream buffers are all GI best management practices that can maximize sediment retention and protect water conveyances systems from sediment buildup.

NHMP Actions

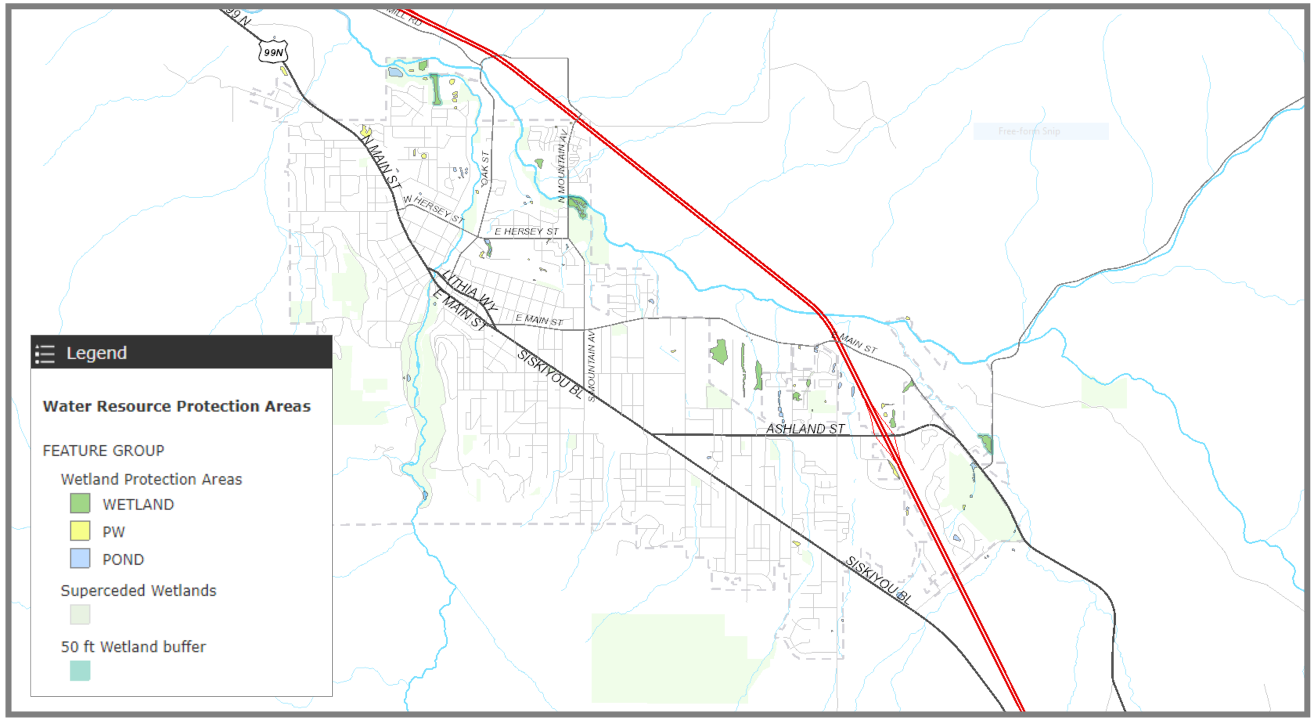
Possible NHMP action items to support the ecosystem service of sediment retention include:

- Continue support for the Ashland Forest All-Lands Restoration (AFAR) project that manages the upper Ashland Watershed for wildfire mitigation, steep slope stability, and sediment retention
- Increased development and maintenance of vegetative buffers along surface water conveyance channels can protect steam channels from sediment buildup.
- Bioretention facilities can be constructed alongside highly developed areas to prevent sediment from reaching water conveyance systems.

Floodwater Storage

The capacity of the ecosystem to store water and the extent of riparian zones for retention of stormwater is a measure of floodwater storage. Floodwater storage occurs in all locations that retain stormwater, and the greatest floodwater ecosystem service is provided by wetlands, particularly floodplain wetlands. Wetlands and floodplains within and downstream of urban areas are an effective tools for capturing the increased volume and rate of surface water runoff and channeled water from upland impervious surfaces and buildings. Successful floodwater storage detains and retains floodwater slowly releasing it as the flood risk decreases.

Localized floodwater storage with dry and wet detention ponds can provide localized floodwater storage that can protect against localized flooding in developed areas.



TAKEAWAY

Ashland currently has two types of wetland protection zones: locally significant wetlands and other possible wetlands. These areas are currently protected by buffer zones. The largest wetland areas are located along Ashland Creek and Bear Creek. GI approaches such as wetland restoration and floodplain connections can expand Ashland's floodwater storage helping to protect downstream communities from flooding.

NHMP Benefits

Floodwater storage can help to mitigate the number and severity of localized and downstream flood events.

- Successful floodwater storage strategies protect urbanizing floodplains and mitigates localized flooding by absorbing rainfall and keeping water from burdening pipe networks or causing damage by pooling in streets or basements.
- Adequate floodwater storage allows for groundwater recharge and the overall regulation of water flows, reducing instances of flooding.
- Floodwater storage sites help to recharge groundwater and support year-round stream flow that protects against the effects of drought and contributes to healthy and more fire resistant vegetation.

GI/LID Best Management

Reducing the watershed's susceptibility to flood events is the goal of GI and LID best management practices for floodwater storage.

- Rain gardens, infiltration strips, bioswales, stormwater planters, and soakage trenches are all LID best management practices that can be applied at the site level to decrease stormwater runoff that reaches floodwater storages sites.
- Dry and wet detention ponds, constructed wetlands, floodplain benching, and restored and reconnected floodplains are all GI best management practices that can detain, retain, and slowly release floodwater.

NHMP Actions

Possible NHMP action items to support the ecosystem service of floodwater storage include:

- Restored and constructed wetlands along Bear and Ashland Creek in the lower portions of the Ashland city limits can increase the floodwater storage capacity of the Ashland Watershed.
- Similarly, floodplain benching and restored and reconnected floodplains along Bear and Ashland Creek can also increase the floodwater storage capacity of the Ashland Watershed.

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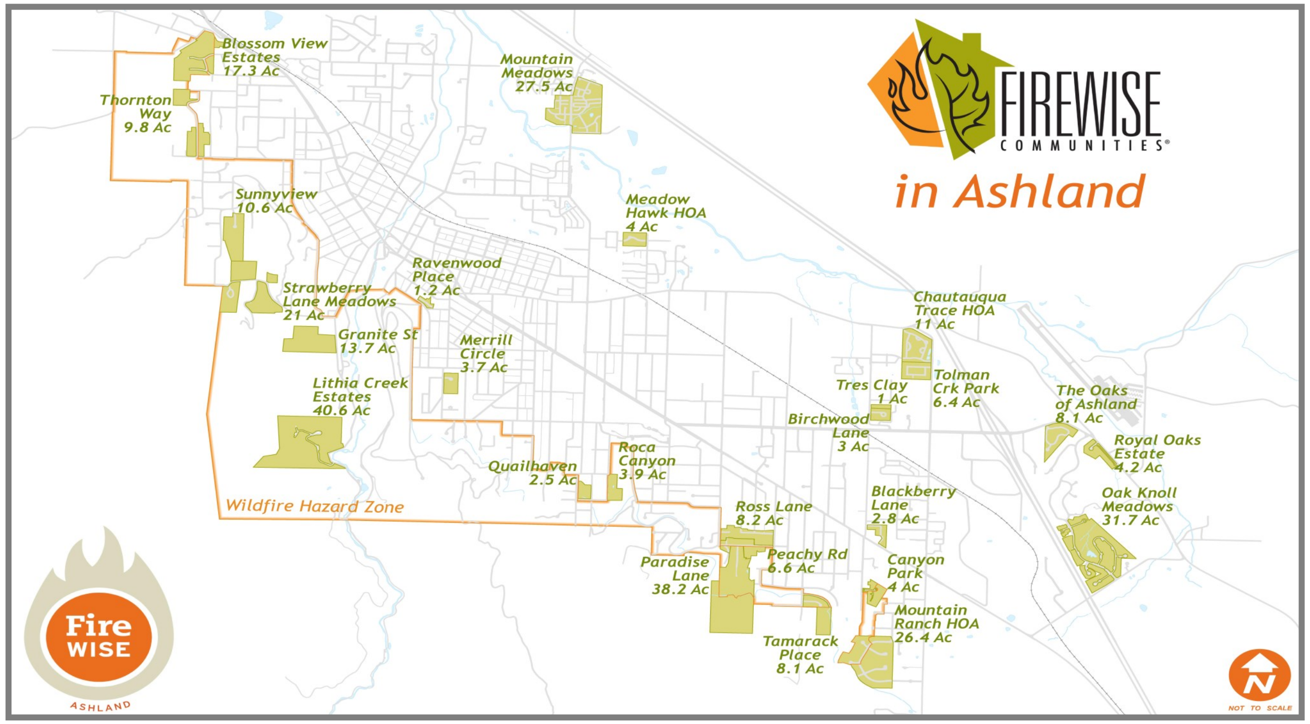
WILDFIRE RESILIENCE

Wildfire resilience is achieved through a healthy forest ecosystem, making a healthy forest a valuable ecosystem service. Fires are a normal occurrence in a healthy forest, leaving stronger, older, and healthier trees. Natural fire cycles support animal and plants that are adapted to, or even require, the effects of fire. The reduction of fire events due to fire suppression tactics has led to the accumulation of larger fuel loads from younger and less healthy trees, invasive and fire prone plants that can outcompete native wildfire resistant species, and vegetation that has been weakened or killed by invasive insects or drought.

Wildfire resilient communities help manage risk through the reduction of fire loads in the watershed, the selection of drought-tolerant and fire resistant vegetation, landscaping standards, and defensible space standards.



TAKEAWAY

Ashland has undertaken significant efforts to improve wildfire resilience of the watershed with the Ashland Forest All-Lands Restoration Project (AFAR) and with its 24 recognized Firewise Communities within the city limits. Continued expansion of Ashland's wildfire resilience can be accomplished with city wide utilization of Firewise standards, landscaping, and defensible space.

NHMP Benefits

Wildfire resilience can decrease the occurrence and severity of wildfire events and protects vegetation that stabilized steep slopes and decrease post fire sedimentation of water conveyance systems.

- The use of fire resistant vegetation and the creation of defensible space around structures can mitigate the damage to property from wildfire events.
- Managing the greater watershed to reduce the occurrence of large scale and severe wildfires by reducing the fuel load with strategic thinning and other active forest management techniques helps to prevent wildfires from encroaching on the Urban-Wildland Interface region of Ashland.

GI/LID Best Management

Decreasing watershed's susceptibility to fire is the goal of GI and LID best management practices for wildfire resilience.

- Wildfire resilience requires the participation of all, or the vast majority of land owners, to undertake creation of defensible space and planting of fire resistant landscaping as part of LID best management practices for increasing wildfire resilience.
- Active forest management techniques including thinning, fuel load reduction, and slope stabilization are GI best management practices for increasing wildfire resilience in the Ashland Watershed.

NHMP Actions

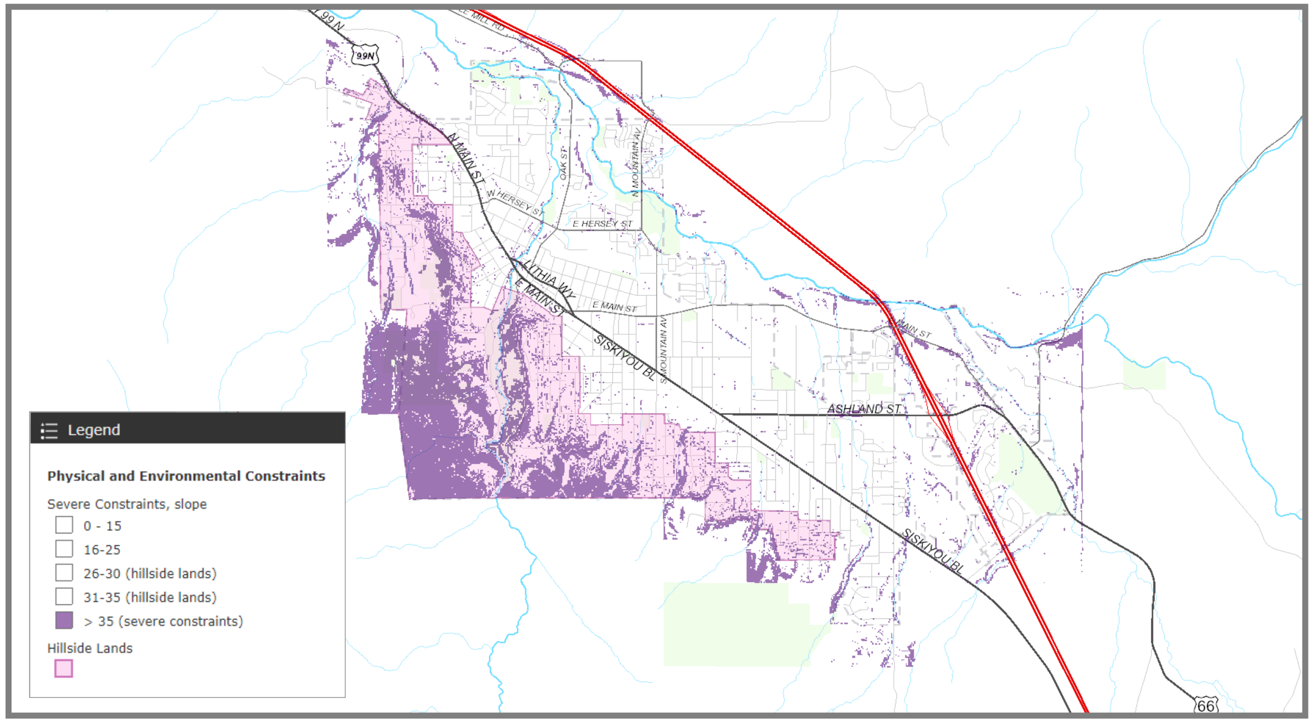
Possible NHMP action items to support the ecosystem service of wildfire resilience include:

- Continue support for the Ashland Forest All-Lands Restoration (AFAR) project that manages the upper Ashland Watershed for wildfire mitigation, steep slope stability, and sediment retention.
- Expand the Wildfire Hazard Zone (WHZ), Development Standards for Wildfire Lands, and Fuel Break Prohibited Plant List to cover all of Ashland to increase the overall communities resiliency to wildfire events.
- Continue to expand neighborhood participation and certification through the Firewise Communities program to support wildfire resilient neighborhoods.

Steep Slope Stability

Steep slope stability is a valuable ecosystem service for controlling sedimentation and for decreasing the size and number of landslides. Landslides occur when heavy rains dislodge and eventually destabilize the soil on steep slopes. Landslides can be exacerbated, or even caused by, human development near steep slopes that decrease slope stability.

Development increases impervious surface cover and during rain events increases flow, especially if the drainage systems are insufficient or direct water toward the slopes. When the soil of steep slopes are saturated, soil can dislodge and cause a landslide. Therefore, steep slope stability depends greatly on decreased impacts of development near steep slopes, on the strength of the slope vegetation and soil, and on effective stormwater management



TAKEAWAY

Ashland is a hillside community with slopes exceeding 35% in the South-West portion of the city and within the greater Ashland Watershed that lies above the city. Supporting steep slope stability by minimizing runoff and stabilizing slopes with vegetation not only mitigates the risk of landslides, but also supports sediment retention and protects surface water systems from damage.

NHMP Benefits

Steep slope stability can support sediment retention and decrease the occurrence and size of landslide events.

- Steep slope stability decreases sedimentation of surface water conveyance systems that can lead to increased risk of flooding.
- Vegetation helps to prevents sedimentation by increasing the soils ability to resist movement and decreases soil saturation with evapotranspiration mitigating the risk of landslide events.

GI/LID Best Management

Decreasing watershed's susceptibility to landslides is the goal of GI and LID best management practices for steep slope stability

- The use of LID best management practices such as amended soils, urban trees, rain gardens, bioswales, stormwater planters, infiltration basins, and pervious pavers, pavement, and asphalt above steep slopes to increase infiltration and decrease runoff promotes steep slope stability.
- To stabilize steep slopes vegetation and trees can be planted and maintained at both the site and landscape scale to protect steep slopes from landslide events.

NHMP Actions

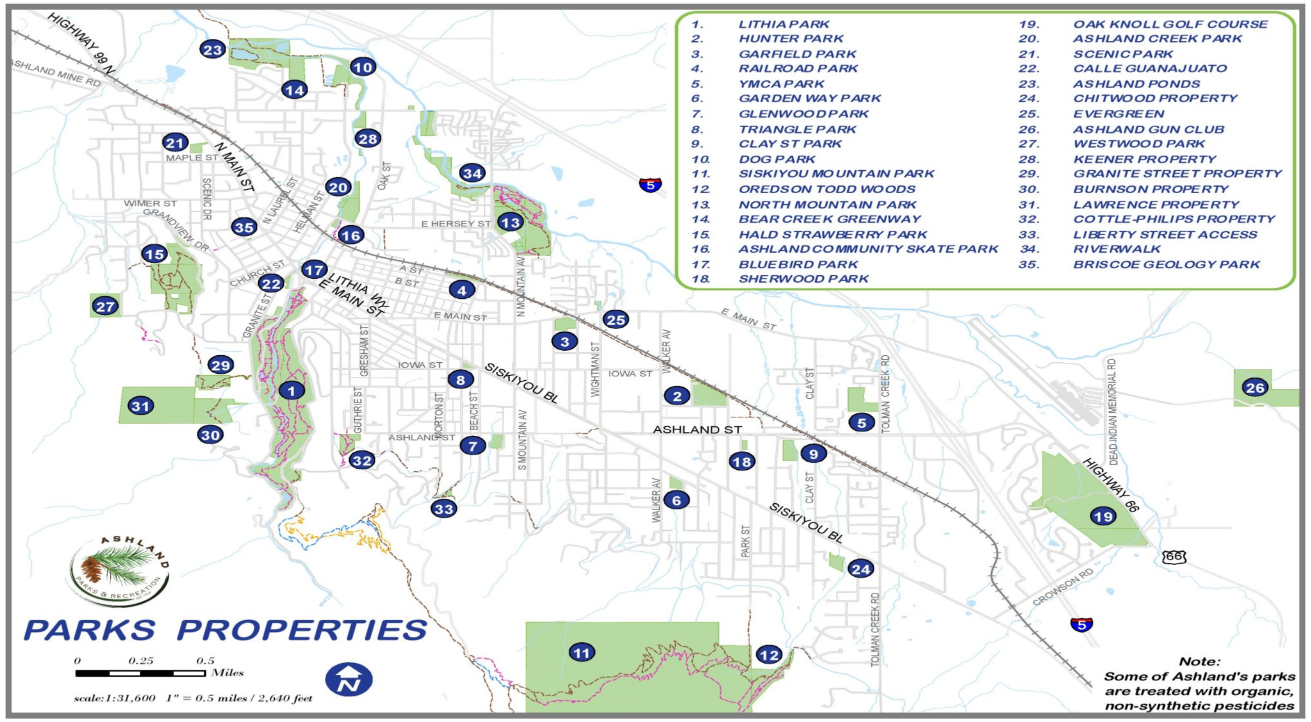
Possible NHMP action items to support the ecosystem service of steep slope stability include:

- Continue support for the Ashland Forest All-Lands Restoration (AFAR) project that manages the upper Ashland Watershed for wildfire mitigation, steep slope stability, and sediment retention.

CULTURAL & LIVABILITY SERVICES

Landscapes provide aesthetic and recreational features which promote livability among residents and visitors. These services can be protected and enhanced as stream and wetland buffers, parks, open space, trails, or nature preserves. There is often a strong overlap between landscapes of high cultural value, landscapes with high ecological value, and landscapes with existing or potential natural hazard risk reduction benefits.

Ashland's extensive park and trail system supports steep slope stability, wildfire resiliency, protects surface water conveyance systems, and provides for floodwater storage that all contribute to Ashland's natural hazard resiliency.



TAKEAWAY

Ashland is well known for its parks and trail system. These provide important cultural and livability services that enhance the quality of life for visitors and residents. Stream and wetland buffers, parks, open space, trails, and nature preserves are also important city controlled assets for GI and LID projects that support numerous ecosystem services with natural hazard mitigation benefits.

NHMP Benefits

Landscapes with cultural and livability services can support numerous ecosystem services that have natural hazard mitigation benefits.

- Surface water conveyance (e.g. stream and trail networks)
- Surface water storage (e.g. wetlands, ponds, park fields)
- Permanent open space buffers between mapped hazard and development areas
- Create multi-objective, multi-use, trail, pathway, and evacuation systems
- Improve the aesthetic of risk reduction structures and projects (i.e. green vs. gray infrastructure)

GI/LID Best Management

Enhancing the overall resiliency of the Ashland Watershed to natural hazards is the goal of GI and LID best management practices for cultural and livability services.

- Utilize park and open space as a mechanism to preserve floodplains
    - Establish flood plain preservation areas within park boundaries (e.g. Ashland's Vogel Park)
    - Reduce hardscape
    - Plant native trees and vegetation
- Protect, preserve, or restore wetland functions
- Cultural service maintenance techniques
    - Conserve fast draining soils
    - Protect trees
    - Reduce runoff

NHMP Actions

Possible NHMP action items to support the ecosystem service of cultural services include:

- Include GI- and LID-based natural hazard mitigation planning actions as a component of parks and recreation master planning as was done with the Lithia Parks Master Plan Request for Proposal (RFP).
- Consider hazard objectives in the planned restoration of the Vogel Creek property.
- Expand the Ashland Lawn Replacement program

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Freshwater Provisioning

The 15,000 acre Ashland Creek Watershed begins on the slopes of Mt. Ashland and drains into Reeder Reservoir, the source of the City's municipal water supply. The main sources of fresh water are precipitation and the snowpack from the surrounding mountains. The naturally filtrated water emerges in local streams, most prominently in Ashland Creek that feeds the Reeder Reservoir. Ashland's Water Treatment plant is currently located below Reeder Reservoir.

The ability of the ecosystem to provide clean freshwater is a key benefit to the city and the region. According to the Freshwater Trust, freshwater encompasses agriculture, industry, fisheries, drinking water, recreation, and more. In Neil Creek alone, restoration efforts have resulted in a 16,000 percent increase in documented Coho and Chinook salmon over a two-year period.

TAKEAWAY

Ashland's location means it is inextricably linked to water. A significant portion of the City's infrastructure is tied to water: drinking water, storm and floodwater control, wastewater, and habitat. Secondary benefits derived from the utilization of GI and LID approaches to risk reduction include habitat preservation, recreation, water quality, and tourism.

NHMP Benefits

Freshwater provisioning

- Many of the techniques used to protect water quality – vegetated streamside buffers, wetlands, detention basins, groundwater recharge, etc. – also provide important erosion control, flood reduction and drought mitigation services

GI/LID Best Management

Improving freshwater quality while decreasing hazard impacts is the goal of GI and LID best management practices for freshwater provisioning.

- Reduce runoff
- Employ infiltration solutions to reduce flow volumes while increasing water quality

NHMP Actions

Possible NHMP action items to support freshwater provisioning include:

- Maintain and enhance existing water department policies related to installing culverts, detention ponds, and filtration ponds throughout the city to direct runoff and filter water, as well as store water.
- Maintain and enhance the Water Advisory Committee's efforts to hold runoff during the wet season, construct new dams, reuse water and irrigate with wastewater effluent. These could involve more GI/LID solutions.
- Relocate the water treatment plant.