

## Chapter 2 Natural Resources

Sustainable land use patterns that protect natural resources are necessary for the environmental health of the City. The conservation and sustainable use of natural resources are fundamental to maintaining the quality of the environment, achieving strong and stable physical and economic development, promoting health of residents, and preserving community identity. Implementation of this chapter will maintain the quality of the environment and preserve the City's natural beauty.



This chapter presents basic inventory information regarding existing natural resources, grouped by land, water, and biological, current issues, and numerous policies.

### Previous Plans

It is important to understand that natural resource features do not follow community boundaries; therefore, it is important to consider their patterns and inter-relationships on a broader scale. Further, many of the programs for protecting or mitigating impacts on natural resources are administered at the County, State or Federal level.

These plans were prepared specifically to address the protection and management of natural resources

#### Marathon County Land and Water Resource Management Plan 2021-2030

The Marathon County Land and Water Resource Management Plan outlines a comprehensive strategy for the implementation of soil and water conservation in Marathon County. The Land Conservation and Zoning Committee identified the following long-term goals for natural resource protection efforts in Marathon County:

1. Land resources are improved and protected county-wide.
2. Surface water quality is improved and protected.
3. Groundwater quality and quantity is improved and protected.
4. Actively educate and engage all community stakeholders to develop an understanding of land, surface water, and groundwater quality concerns.

The plan was developed with the assistance of partner agencies, including the Wisconsin Department of Agriculture, Trade and Consumer Protection, Wisconsin Department of Natural Resources, and Extension-University of Wisconsin-Madison.

#### Marathon County Groundwater Protection Guide 2001

This guide is an extension of the efforts established with adoption of the Marathon County Groundwater Plan in 1988. It is intended to guide local and County officials in setting policy. It also serves as a resource of information about groundwater and other natural resources and recommends strategies to address issues related to groundwater protection.

#### City of Wausau Wellhead Protection Plan 1997

The City requires all development in the City of Wausau to be served by public water connections. The wellhead protection plan encourages environmentally safe land uses near well recharge areas. Currently, there are 4 wells located on the north side of the city west of the Wisconsin River and a fifth well is located on the east side of the river. The wellhead protection area is divided into Zone A nearest to the well and Zone B where contamination would take more than 5 years to reach the wells. The Wausau City Wellhead Protection Ordinance provides restrictions for commercial development in the wellhead protection area to discourage businesses that are likely to cause groundwater contamination from locating there.

### **City of Wausau Sewer Service Area Plan 2018**

All development in the City of Wausau is required to be served by the City's public sewer. The purpose of the SSA plan was to establish a sewer service boundary for the Wausau Urban Area. This boundary sets the maximum limit for the extension of sanitary sewer services in a cost effective, environmentally sound manner through the year 2040. Property located within the sewer service boundary line is eligible to receive sanitary sewer service during the planning period; any property lying outside this sewer service area boundary would not be eligible to receive this utility service unless the boundary were amended. Thus, the sewer service boundary also functions as a community growth boundary for Wausau since all development in the City must have sanitary sewer service. Several other communities were included in this planning process.

### **NCWRPC Regional Comprehensive Plan 2025**

This regional plan for the 10-county North Central Wisconsin region identifies natural resources as both enhancing the local quality of life but also as an economic development tool as outdoor recreation attracts workers to the region.

### **Outdoor Recreation Plans**

The City, County, and State all have Outdoor Recreation Plans that guide the development of parks and open space in Wausau. These are discussed in Chapter 5: Utilities and Community Facilities.

### **River Edge Parkway Master Plan 2020**

This plan, which is still being implemented, has led to the development of a continuous bicycle-pedestrian trail along the east and west sides of the Wisconsin River.

This plan focuses on improving public access to the Wisconsin River. The plan focuses on development of the River Edge Parkway, which is intended to physically link the parks located along the river; improve pedestrian and bicycle transportation facilities; and enhance recreational opportunities. This plan's recommendation for a trail system along the river is still being implemented.

## **City Affiliations**

### **Green Tier Legacy Community (2020 to present)**

WDNR has designated the City as a Wisconsin Green Tier Legacy Community (GTLC). This award reflects the City's commitment to sustainable and resilient development. It also gives the City several benefits, such as improving its chances of receiving grant funding, access to collaborative learning and resource sharing opportunities, and technical support.

### **Wisconsin Local Government Climate Coalition (WLGCC)**

The City is a member of the Wisconsin Local Government Climate Coalition (WLGCC), a nonprofit organization that communicates strategies for municipalities to approach decarbonization, address climate change, and benefit from the clean energy economy. The designations, awards, and memberships that the City has acquired require recertification and continued commitment to the practices established for each designation.

## Land Resources

The City land area is about 13,000 acres. Much of that is devoted to uses, such as residential, roadways, water, commercial and industrial areas. However, there are substantial areas that are open or wooded within the City. See the Natural Resources Map.

The topography in the City of Wausau varies from nearly level to quite steep. Much of the area immediately adjacent to the Wisconsin River is extremely flat. This flat topography has helped support high-density residential and commercial development on relatively small parcels of land. On the east side of the river, a hill and valley topography becomes evident several thousand feet east of the river. The valleys tend to be oriented in an east-west direction and are defined by small streams that originate only a few miles east of the City limits in the Town of Wausau. On either side of these intermittent streams are relatively steep-sloped hills that terminate in fairly flat, high plateau areas. Several of the arterial streets that carry traffic east of the City, including Town Line Road, McIntosh Street, Franklin Street and Wausau Avenue, are constructed on top of these plateau areas.

On the west side of the Wisconsin River, the general topographic conditions are quite different than on the east side. While the area adjacent to the Wisconsin River is quite flat for a considerable distance west of the river, the streams and steep hill and valley topography are not nearly as pronounced. The principal topographic feature on the west side of Wausau is a large, steep hill located between Bridge Street and Stewart Avenue that rises in elevation west of Fourth Avenue. Much of the topography near the Big Rib and Little Rib Rivers is also relatively flat. Farther from these rivers, hilly topography is encountered and the prospect of finding bedrock near the surface increases.

### Soil Types

As shown on Map X, there are generally two types of soils in the Wausau area that were formed because of the last glacial period. These include upland soils that are dominantly stratified drift (Mahtomedi-Fordum-Sturgeon soil association) and upland soils over bedrock (Fenwood-Rietbrock-Rozellville soil association). Within these two general soil associations are several types of soils with differing physical characteristics regarding depth to groundwater, flooding, depth to bedrock, slope, and presence of stones. These physical characteristics affect the suitability of the soil for certain types of urban development.

Several soils in the Wausau area are characterized by large stones and rock outcrops, which can present problems when developing the land. Large stones can be removed by bulldozing, but rock outcrops must be either designed around or removed by blasting which will increase development costs significantly.

### Prime Farm Soils

The United States Department of Agriculture (USDA) classifies soils based on their suitability for growing crops. Class 1 soils are best for growing all crops, and Class 2 soils are also highly suitable yet more prone to wetness than Class 1 soils. Given these characteristics, Class 1 and Class 2 soils are referred to as prime soils, and they can be found in the east and northwest sides of the City as well as along the Wisconsin River. The Marathon County Cropland Evaluation System (CES) a soil rating method used in local comprehensive planning and zoning based on these characteristics.

### Brownfields

Some soils are contaminated due to current or previous land use activities that occurred on them. Since soil remediation funding is typically tied to site reuse and redevelopment, this topic is explained in detail in Chapter 6: Economic Development.

### Soil Limitations for Development

The presence of groundwater can affect site suitability for development. It is common for groundwater to be less than one foot from the soil's surface near surface water bodies and within wetlands and floodplains. These areas do not support development and are prone to flooding. When groundwater is found three to six feet underground

can also have issues with flooding and wetness, but draining and filling these areas can sometimes make them more developable. But the need for these modifications, along with possible flooding, settling, and the resulting foundation cracks can make these areas cost-prohibitive to develop.

Frost-heave is also common in areas with a high water table, which increases road construction and maintenance costs. It also increases costs and maintenance issues with public water and sewer pipes. Additionally, perched water tables can be found in Wausau. These occur where a layer of clay or other impervious material restricts the downward movement of water and creates a saturated area above the normal water table. Seasonally, this may create wetness problems if those areas are developed. In addition, in areas of steep slopes, a perched water table can be exposed to create seepage, an area where water continually flows from the surface, similar to a spring.

Soils will also vary according to depth to bedrock. A depth to bedrock of 60 inches or more has only slight limitations to urban development. Soils with a depth to bedrock of less than 60 inches pose problems in terms of development, especially in areas of steep slopes. Shallow depths to bedrock are common in the upland soils in Wausau, particularly along the eastern City limits and north of the Wausau Aspirus Hospital complex. Generally, most of these soils average a depth to bedrock between 42 and 48 inches. The bedrock is typically fractured igneous and metamorphic rock.

Soils that are shallow to bedrock are unsuitable for septic systems because the soil depth is inadequate for absorption fields. Although Wausau is served by public sewer and water, there may be older residences built over shallow bedrock with failing septic systems in areas contiguous to the City. Additionally, shallow bedrock poses the same frost heave risks that shallow depth to groundwater does. Finally, shallow bedrock and steep slopes increase development costs and limit development configurations due to the high cost of excavating and/or filling to work around the bedrock and/or slopes.



#### Topographical Limitations for Development

As shown on Map X there are several steep, hilly areas within and adjacent to the City that are likely to remain undeveloped due to the high costs of constructing public and private improvements in these areas. Elevations range from 1,160 feet above sea level on the shores of Lake Wausau to approximately 1,500 feet above sea level near the intersection of West Wausau Avenue and 28th Avenue. High construction costs can be encountered when developing in these steep slope areas. Development in such areas increases stormwater runoff and erosion.



Structures and parking lots constructed on areas with steep slopes or shallow to bedrock are subject to slippage without proper engineering. Retaining walls can be used to mitigate this issue, but they are costly and can crack or shift over time. Disturbing vegetation on steep slopes also increases erosion and stormwater runoff, affecting water quality and drainage patterns. In summary, Wausau's steep slopes and presence of shallow bedrock restrict the ability to create cost-effective, structurally sound development in many locations.

Special consideration must be given to the design of streets so that the grade follows the contours as closely as possible. Where the grade does not follow contours, streets must be shaped by cutting and filling, a costly construction method. Snow removal and salting must also be given a higher priority on roads with steeper grades, especially those with a north-facing exposure.

The relatively steep hill-and-valley topography in the Wausau area has limited the development of a north-south arterial street that would extend from Town Line Road (CTH N) north to Evergreen Road. A planning and engineering study completed for a Grand Avenue alternative route concluded that, due the topographic conditions, the 41st Street/Camp Phillips Road (CTH X) corridor is the nearest opportunity for an arterial street in this area which would connect Town Line Road to Evergreen Road.

Installation of public services in areas of steep slopes is usually more costly than in flatter terrain. Depending upon the direction of slope and the elevation, sanitary sewer lift stations and water reservoirs or booster stations may be required. In addition, more manholes in the sanitary sewer system are generally required on steep slopes.

## **Water Resources**

The City of Wausau and Marathon County area contain abundant surface water and groundwater resources. The City lies at the intersection of the Big Rib River, Little Rib River, Wisconsin River, and Eau Claire River, which also form two reservoirs south of the City, Lake Wausau and Eau Claire Flowage. It is important to consider that water resources transcend municipal boundaries and that the City can be impacted by activities that occur upstream along these rivers. Surface waters are also connected to the City's groundwater supply, making them vulnerable to contamination. Protecting these resources ensures that the City has access to reliable, safe drinking water in the future. It also maintains the City's abundant water-based recreation opportunities that contribute to the local economy and overall quality of life.

This Chapter describes the ongoing efforts in place that maintain and improve the City's groundwater and surface water quality. Wisconsin has programs in place to control point-source pollution, such as an industrial discharge pipe, as well as non-point source pollution, which includes animal waste and pesticides in farm runoff, urban runoff, and failing septic systems. Stormwater control and wastewater treatment are described in detail in Chapter 5: Utilities and Community Facilities.

### **Groundwater**

Depth to groundwater varies throughout the City. Sand and gravel aquifers adjacent to the Wisconsin River provide an abundant and easily accessible drinking water supply. The shallow depth to water and permeable soils also make the water supply susceptible to contamination and necessitate the responsible use of potential contaminants. The City's wellhead protection regulations that minimize the ability of pollutants to enter areas where groundwater is pumped are described in detail in Chapter 5: Utilities and Community Facilities.

### **Streams/Rivers**

The Wisconsin River is the most significant natural resource in the City of Wausau. It bisects the City, resulting in a large amount of riverfront property in both public and private ownership. Between the confluence of the Wisconsin and Big Rib Rivers and the dam in Rothschild, the river widens to form Lake Wausau. The Big Rib River flows along the southern edge of the City's western panhandle and enters the Wisconsin River at the north end of Lake Wausau, which forms the southern boundary of the City. The Little Rib River flows through the "panhandle" area before entering the Big Rib River. On the north end of the City, Moore Creek flows through Tribute Golf Course before entering the Wisconsin River. The Eau Claire River and Eau Claire Flowage border the City's southeastern

edge, and it eventually meets the Wisconsin River in the City of Schofield. Streams and rivers in the City are shown on Map X.

In summary, threats to these bodies of water include nitrates, pesticides, bacteria, high biochemical oxygen demand (BOD), and erosion due to upstream conditions such as poor agricultural practices. Within the City of Wausau, legacy industrial contamination and nonpoint source pollution from runoff over impervious surfaces are the main threats. For example, garbage, road salt, oils, automotive fluids, brake dust, and other substances that accumulate on roads can be carried into waterways by heavy rains. Additionally, soils that erode during heavy rainfall contain nitrates, phosphorous, fertilizers and other nutrient sources that contribute to algae blooms. Therefore, it is essential to not only implement erosion control measures during construction projects but also continue to enforce stormwater management practices, which are described below.

The impact road salt has on water is a growing concern. Salts can be washed over land or through groundwater into nearby surface water and can remain in soil and groundwater for decades. Increases in sodium and chloride can also increase mobilization of heavy metals in soil along major highways. Groundwater contamination can also negatively affect well water taste in areas with heavy salt concentrations.

In lakes and streams, salty water is dense and sinks into pockets in the substrate, preventing it from mixing and diluting. The result is that this colder water, which many fish and aquatic organisms depend on for wildlife habitat, becomes deoxygenated. Even at moderate levels, road deicing agents can enter wetlands and effect amphibian health and reproduction and alter wetland food webs. Native plants in wetlands are also impacted by salt, making it easier for invasive species to spread.

In summary, salt impacts a wetland's habitat quality and ability to protect groundwater quality. Finally, vegetation along highways where salt is applied is more likely to experience insects, pathogens, and other diseases because the salt can become airborne when applied. This makes them less likely to withstand harsh winter conditions, and it makes it easier for salt tolerant invasives to take over plant communities. To mitigate these concerns, Wisconsin Salt Wise is an organization that provides resources that help communities manage salt application, which can save money while reducing environmental impact.

Outstanding Resource Waters (ORW) and Exceptional Resource Waters (ERW) designations are derived from an amendment to the U.S. Clean Water Act, which directed states to identify waters that were largely unaffected by pollution and should remain that way. States were required to develop anti-degradation policies to protect these waters from pollution. There are no designated ORW or ERW in the City of Wausau.

### **Stormwater Management**

Topography influences the rate of stormwater runoff. Care must be taken to ensure that development in steep areas does not result in downstream flooding. This is especially true on the east side of Wausau where most of the downstream property close to the Wisconsin River has been completely developed. As construction activities have proceeded upstream and onto the adjacent hillsides, existing storm sewers in some portions of the City have reached their capacity and are no longer capable of accommodating additional runoff. Thus, the frequency of flooding in certain drainage basins has increased dramatically.

Where down slope storm water drainage is a concern, keeping development relatively low density and/or maintaining a natural conservancy area will maximize runoff infiltration and help protect other property in the watershed from flooding. The utilization of green infrastructure could also alleviate these concerns. Regardless of the existing conditions in the watershed, stormwater management practices need to be incorporated into all development to reduce runoff and help improve water quality. Stormwater management is further discussed in Chapter 5 in this plan.

### **Floodplain**

Floodplains consist of land likely to be covered by floodwater during the regional (100-year) flood. Floodplain areas are based on information compiled by the Federal Emergency Management Agency (FEMA) on Flood Insurance

Rate Maps (FIRM). The floodplain includes the floodway and the flood fringe. Areas within the 100-year floodplain are located immediately adjacent to the rivers and streams flowing through the City.

Managing the water that runs off during a rainstorm or when the snow melts is becoming a more difficult issue for the City, especially as growth extends farther upstream into relatively undeveloped areas. The Wisconsin River, Big Rib River, Little Rib River, Eau Claire River, and the tributaries that drain into these rivers are all impacted by urban development, which increases impervious surfaces and reduces the amount of undeveloped areas that can absorb runoff. Several smaller tributaries disappear as they enter the City limits because they enter the City's storm sewer system and are conveyed to their destination in large storm sewer pipes, which may no longer be sized appropriately for larger rainfall events and runoff volumes.

### **Wetlands**

Wetlands in Wisconsin were defined by the State Legislature in 1978 as: "an area where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic (water-loving) vegetation and which has soils indicative of wet conditions." Programs at three levels of government - local, State and Federal - regulate activities in wetlands. There are dozens of wetland types in Wisconsin, characterized by vegetation, soil type, and degree of saturation or water cover. Some of the more prominent wetland types are:

**Aquatic Bed** wetlands contain plants growing entirely on or in a water body no deeper than 6 feet. Plants may include pond-weed, duckweed, lotus, and water-lilies.

**Marshes** are characterized by standing water and dominated by cattails, bulrushes, pickerel-weed, lake sedges, and/or giant bur-reed

**Sedge or "Wet" Meadows** wetlands may have saturated soils, more often than standing water. Sedges, grasses and reeds are dominant, but look also for blue flag iris, marsh milkweed, sneeze-weed, mint and several species of goldenrod and aster.

**Scrub/Shrub** wetlands include bogs and alder thickets and are characterized by woody shrubs and small trees such as tag alder, bog birch, willow, and dogwood.

**Forested** wetlands include bogs and forested floodplain complexes. They are characterized by trees 20 feet or more in height such as tamarack, white cedar, black spruce, elm, black ash, green ash, and silver maple.

Many wetland areas in Wausau, especially along the Wisconsin River, were drained and filled as the City developed. Most existing wetlands in the Wausau area are located near surface water drainage ways such as the Big Rib River or Little Rib River. Due to springs, seeps and unusual soil conditions, however, some wetlands are located on relatively steep slopes and even in depressions on hilltops.

Most known and suspected wetlands in the City have been mapped, but a site-specific study is often necessary to determine with a higher degree of certainty whether a "green field" development project will have a negative impact on wetlands. There is also strong public interest in preserving wetlands since these areas have important natural functions, such as stormwater management and wildlife habitat, which make them particularly valuable natural resources.





## Biological and Ecological Resources

### Wildlife Resources and Habitat

Wildlife resources include a variety of game and non-game species of birds, mammals, fish, reptiles and amphibians that live in Marathon County. Common types of wildlife include deer, bear, coyotes, wild turkeys, raccoons, squirrels, songbirds, waterfowl and raptors. Wildlife resources are abundant in the many undisturbed sanctuaries, refuges, reserves, and scattered habitats located throughout the County. Numerous other species of migrating birds use habitat in Marathon County for food, shelter, and resting stops during seasonal migration.

Threatened and Endangered Species in the City include Drooping Sedge, Missouri Rock-creep, Snowy Campion, Vasey's Pondweed, Acadian Flycatcher, American Bittern, Black Redhorse, Blanding's Turtle, Broad-banded Forestsnail, Cerulean Warbler, Elktoe, Henslow's Sparrow, Northern Flying Squirrel, and Peregrine Falcon.

There is a significant amount of wildlife habitat in Marathon County. Natural areas within the City serve as wildlife corridors connecting larger habitats, and also add value as recreational areas. Habitats along the Wisconsin River are a good example of a corridor. In addition to area parks and other natural areas, major wildlife habitat areas include Rib Mountain State Park, which is visible to, but outside the City of Wausau. Additionally, the Ice Age National Trail traverses the county, with the Dells of the Eau Claire River County Park segment being among the most scenic amenities in the greater Wausau area.

Since 2012, Wausau has been a member of Bird City Wisconsin. This statewide program indicates that the City meets certain criteria for improving bird habitat in urban areas. This City also has "High Flyer" status due to the work of residents and staff that preserves habitat, reduces threats to birds, educates the community, and institutionalizes sustainability efforts. See Bird City Wisconsin's website for more information.

### Urban Forestry and Vegetation

Wausau is mostly developed, so the predominant vegetation consists of urban landscaping such as trees, shrubs and private gardens. More natural wooded areas and wetlands occur in parks, along the rivers, or in undeveloped areas. Wausau is located just north of the tension zone, a diagonal strip that crosses Wisconsin where prairies to the south and forests to the north intersect. In the tension zone, plant species from both ecosystems are present, giving the area a high diversity of plant communities. This means that some species found more abundantly in warmer climate zones to the south may still thrive in Wausau, while hardier northern species can also grow in the City. Leveraging Wausau's location near the tension zone to expand the diversity of trees creates a more resilient tree canopy. A mature, interconnected tree canopy also provides Citywide wildlife habitat.

Trees are a critical part of the City's infrastructure. They improve air quality, help manage stormwater, reduce the urban heat island effect, lower traffic noise, enhance community livability, increase property values, and promote a sense of wellbeing. The City's extensive tree management, planting, and maintenance program has earned Wausau the nationally recognized Tree City USA designation every year since 1981. This Arbor Day Foundation award requires the City to meet certain standards for planting and caring for trees, and the award recognizes past and ongoing efforts. The City's "Growth Award" indicates that it meets an even higher standard for tree care and community engagement. To maintain its Tree City USA designation, the City must spend at least \$2 per capita on forestry, have a forestry department or committee, have a tree ordinance, and must celebrate Arbor Day. See the Arbor Day Foundation's website for details.

Vegetation, especially in the form of prairie plants native to Wisconsin, also supports pollinator habitat. In 2022 and 2026, Wausau took the Mayors' Monarch Pledge. This effort is led by the Sustainability, Energy, and Environment Committee (SEEC), which teaches residents plant monarch-friendly gardens and delay mowing schedules in pollinator areas. There is also a student-created demonstration garden at City Hall as a result of these efforts. Invasive species threatens native vegetation throughout the City. Japanese knotweed, garlic mustard, and buckthorn are particularly problematic and must be strategically removed to further protect and enhance pollinator habitat.

## Environmental Corridors

Environmental corridors are large, contiguous tracts of land that support wildlife habitat and the movement of wildlife throughout the City. They usually occur along waterways and steep slopes where soils limit development. Two major examples in the City include the River Edge Parkway along the Wisconsin River and the Eau Claire River Conservancy in the southeast corner of the City. Not only do these corridors benefit the environment by protecting wildlife habitat, but they also help reduce pollution and improve public health by functioning as transportation alternatives and recreation opportunities.

The River Edge Parkway features a bicycle and pedestrian path along both sides of the Wisconsin River, which eventually will be completed to form a loop in the City's core. Though this facility primarily functions as a transportation corridor, it also creates a large corridor of green space and river access where residents and wildlife can interact. The Eau Claire River Conservancy is not as developed, but it features hiking trails through riverine and wetland habitat.

Paff Woods and Sylvan Hill park are similar, but much smaller examples of additional park space that functions as environmental corridors. Together, these environmental corridors provide opportunities for experiencing nature and viewing wildlife in the middle of the City.

There are also conservancy areas in the City that are not publicly owned that also function as environmental corridors. Monk Botanical Gardens features a variety of ornamental and native flowering plants that support pollinators along with a tree canopy and pond habitat that support other types of wildlife. Though this site has been owned by a nonprofit organization since 2003, it is open to the public and remains a landmark in the community for both residents and visitors.

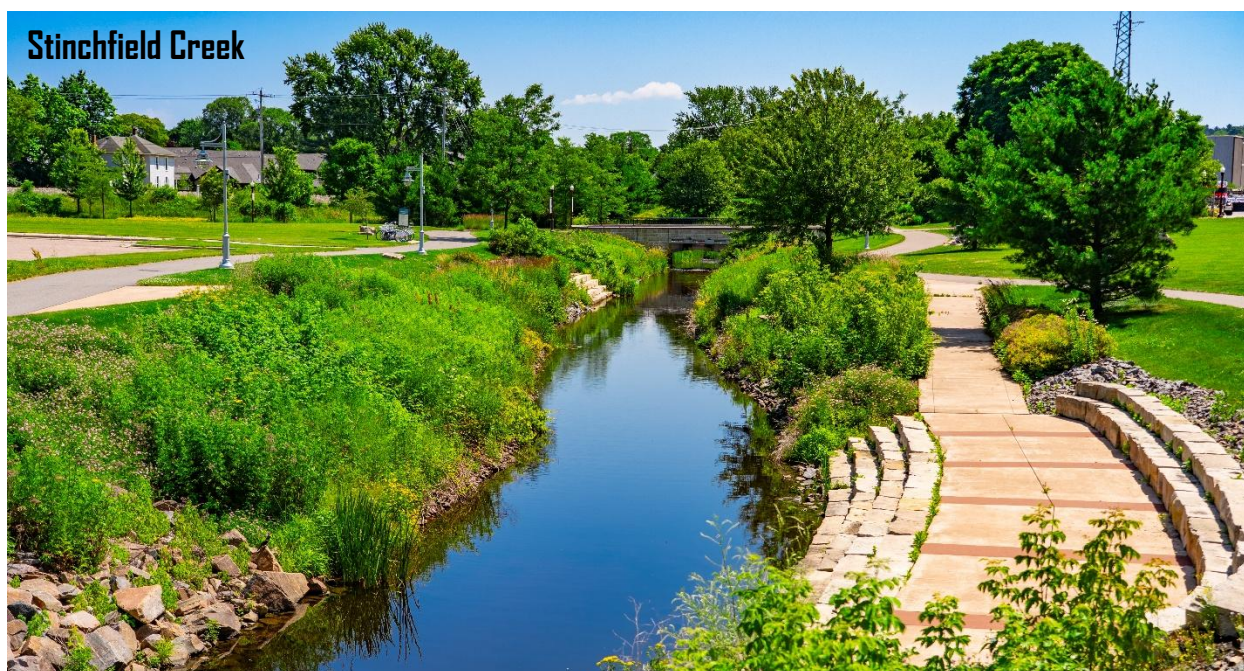




## Green Infrastructure

As the City continues to develop, commitments to environmental sustainability may also be made physically apparent through green infrastructure. Green infrastructure is an environmental management approach that protects, restores, or mimics the natural water cycle and harnesses nature to provide essential community services. It integrates vegetation, soils, and permeable surfaces into the built environment to manage stormwater, reduce the urban heat island effect, and improve overall air and water quality. Additional benefits include carbon sequestration and enhanced wildlife habitat. Common examples of green infrastructure include rain gardens, bioswales, green roofs, maintaining an urban tree canopy, and additional stormwater management practices.

Stinchfield Creek is a waterway that was buried in a culvert during Wausau's early years. The City "daylit" the creek during the redevelopment of the Riverlife Area to provide green infrastructure that adds stormwater storage capacity while providing a neighborhood amenity that features walkways, bridges, and an illuminated fountain. Replacing culverts with a naturally flowing, vegetated stream corridor also improves the ecology and water quality of the creek and nearby Wisconsin River. Continued efforts to embrace environmental sustainability may have additional ecological benefits as well as benefits to local utilities and economic development, which are discussed in Chapter 5: Utilities and Community Facilities, and Chapter 6: Economic Development.



## Climate Change

The Wisconsin Initiative on Climate Change Impacts (WICCI) provides robust data and planning tools related to climate change's impacts on the state as a whole and specific areas within the state. For example, the past two decades were the warmest on record statewide, with temperatures averaging three degrees Fahrenheit higher than in 1950. The past decade was also the wettest, with a 17 percent increase in precipitation since 1950. These trends also have resulted in more frequent extreme weather events, including more intense rainstorms, that threaten the City's health, economy, and natural resources.

Wausau is located just north of the "tension zone" between Northern and Southern Wisconsin, an area where both northern forests meet southern oak savannahs and prairies. It is expected that this tension zone will move north in the coming years as the climate continues to warm, impacting the vegetation that will thrive in the City. This is an especially important consideration for tree plantings, especially for boulevards, parks, right-of-way, and other public land.

North Central Wisconsin is experiencing rapidly warming winters, especially when measuring overnight temperatures, as well as an increase in spring and winter precipitation. These characteristics impact infrastructure, tourism, agriculture, and more, and socioeconomic status also influences how much an individual will be affected by climate change. WICCI's recommended mitigation strategies include:

- Protecting the most vulnerable populations through timely communication on climate-health issues.
- Minimizing converting grassland and natural vegetation to row crops and sprawling development to reduce flooding.
- Maintaining and expanding forest cover and urban tree canopies to sequester carbon.
- Prioritizing habitat management that feeds and shelters wildlife.
- Helping local communities become more resilient by using flood reduction practices, pre-disaster mitigation, and comprehensive planning.
- Designing and building infrastructure that accounts for future climate conditions (for example, stormwater infrastructure that can accommodate increased rainfall).
- Reducing greenhouse gas (GHG) emissions.

For GHG reduction, WICCI suggests rotational grazing and increasing living cover on fields while minimizing sprawl in undeveloped areas, which helps store carbon in soil while avoiding car-centric development. For urban areas, reducing the amount of concrete and steel used to build infrastructure and minimizing impervious surfaces helps reduce GHGs. WICCI has a series of county-level maps that measure climate trends from 1950 to 2024 followed by projections for the year 2060. Data for Wausau are listed in Table 10.



**Table 10: Climate Trends for the City of Wausau**

| Measurement              | 1950-2024 Trend   | 2020-2050 Projection |
|--------------------------|-------------------|----------------------|
| Winter precipitation     | Increase over 20% | Increase over 10%    |
| Spring precipitation     | Increase over 10% | Increase over 10%    |
| Summer precipitation     | Increase over 10% | Decrease over 5%     |
| Fall precipitation       | Increase over 15% | Increase over 5%     |
| Winter nighttime warming | Increase 8°F      | Increase 6°F         |
| Spring nighttime warming | Increase 4°F      | Increase 4°F         |
| Summer nighttime warming | Increase 3°F      | Increase 4°F         |
| Fall nighttime warming   | Increase 4°F      | Increase 4°F         |
| Winter daytime warming   | Increase 5°F      | Increase 4°F         |
| Spring daytime warming   | Increase 4°F      | Increase 4°F         |
| Summer daytime warming   | Increase 2°F      | Increase 4°F         |
| Fall daytime warming     | Increase 3°F      | Increase 4°F         |

Source: WICCI 2026

In summary, temperatures and precipitation are increasing and they are projected to continue increasing. The greatest historical and projected temperature increases are during winter and at nighttime, and the greatest precipitation increases are in winter and spring. Given Wisconsin's relatively cold climate, these increases may seem minor, but it translates to an increase in extreme rainfall events (defined as being greater than two inches in one day) as well as an increase in extreme heat (days over 90 degrees Fahrenheit and nights over 70 degrees Fahrenheit). These changes will impact infrastructure designed for smaller scale rainfall events in the past while threatening public health and safety, particularly for those who do not have access to air conditioning, as the risk of heat-related illnesses increases when temperatures stay elevated above these levels for an extended period. Table 11, below, summarizes these extreme weather events between 1991 and 2020 alongside a 2060 projection for each type of event.

**Table 11: Number of Extreme Weather Events for the City of Wausau**

| Measurement                                   | 1991-2020 Average | 2060 Projection |
|-----------------------------------------------|-------------------|-----------------|
| Days per 100 years with over 5" precipitation | 1                 | 2               |
| Days per 100 years with over 4" precipitation | 4                 | 6               |
| Days per 50 years with over 3" precipitation  | 8                 | 12              |
| Days per 10 years with over 2" precipitation  | 10                | 10              |
| Days over 90°F per year                       | 0-7               | 14-21           |
| Days over 100°F per year                      | 0-2               | 2-4             |
| Nights over 70°F per year                     | 0-5               | 5-10            |
| Nights under 32°F per year                    | 140-160           | 120-140         |
| Nights under 0°F per year                     | 20-25             | 10-15           |

Source: WICCI 2026

According to an interactive map on WICCI's website provided by the University of Maryland, Wausau's climate is predicted to have summers that are 12.3 degrees Fahrenheit warmer and winters that are 13.2 degrees Fahrenheit warmer by 2080, resembling the climate of Central Missouri. Winters are also projected to be 16.5 percent wetter by 2080. This reflects a transition from a climate that favors temperate broadleaf and mixed forests to one that supports temperate grasslands, savannas, and shrublands, indicating that plant species could change dramatically over the next century. WICCI lists several climate-related risks in several categories:

#### **Agriculture**

- Changing growing seasons, extreme weather events, and wet conditions impact planting, growing, and harvesting.
- Increased rainfall increases runoff and soil erosion.
- Extreme heat lowers milk production while increasing water usage.

#### **Forestry**

- Warmer temperatures decrease certain species such as paper birch.
- Increase of pests and diseases.
- Logging is challenged by storm-damaged infrastructure and a reduction in frozen ground.

#### **Plants and Natural Communities**

- Habitat loss and fragmentation as well as invasive species, nutrient runoff, and lack of management are occurring before climate is even considered.
- Climate change accelerates these trends, reducing species diversity and abundance, and contributing to species becoming threatened, endangered, or extinct.
- Loss of plants and natural communities means less carbon being stored, fewer wetlands absorbing floodwaters, and less habitat for a variety of species.

#### **Water Quality**

- Increased runoff from heavy rainfall and warmer temperatures contribute to algae blooms, erosion, sedimentation, rapidly fluctuating water levels, and other water quality concerns.
- Toxic algae blooms and rising water temperatures result in lower levels of oxygen and widespread fish kills.
- Rising water tables can increase contamination risk, especially with septic systems and other underground storage tanks.
- Less ice coverage in winter means lakes and rivers lose more water to evaporation.
- Invasive aquatic species are increasing, and native aquatic species are decreasing in diversity and abundance, impacting fisheries.

#### **Fish and Wildlife**

- Warmer winters with less snow are increasing the amount of white-tailed deer, negatively impacting forestry and vegetation.
- Species like snowshoe hare, ruffed grouse, common loons, and others that depend on a colder climate are facing warmer waters, pests, and other stressors.
- Warmer waters threaten to reduce or eliminate walleye and trout, which are sensitive to water temperatures.

Solutions to prevent exacerbating climate change rely on soil and water conservation practices and the maintenance of large tracts of land with native vegetation to promote carbon sequestration. While there are few opportunities to promote these solutions within City limits, the City can continue to promote growth that protects large, contiguous tracts of land with native vegetation by focusing on infill development. Furthermore, this type of development may also promote active transportation and encourage shorter commutes that may reduce local carbon emissions.

Climate change is also expected to impact tourism and outdoor recreation. Though there is potential for a longer summer season, heat waves will limit outdoor activities, and decreased water quality will impact boating, fishing, swimming, and more. Increased rainfall and flooding can damage hiking trails, boardwalks, and coastal structures like piers and marinas. Additionally, birding, hunting, and fishing seasons will likely be impacted by changing climate trends and habitat loss. Winter recreation such as snowmobiling, ice skating, ice fishing, sledding, fat tire biking, and skiing will have increasingly limited opportunities with decreased ice cover and snowfall. In general, climate change impacts the amenities and resources that attract tourism and outdoor recreation, and extreme weather increases the costs associated with maintaining them.

Overall, municipalities are having to respond to ongoing climate change impacts while planning for future events that are predicted to be more frequent and more intense. This affects the design of infrastructure like bridges, storm sewers, and other flood damage-prone structures as well as local ecosystem resilience, public health, and agricultural productivity. Some municipalities in Wisconsin have adopted Climate Action Plans that have goals to address these concerns along with setting targets for greenhouse gas reduction and renewable energy expansion.

### **Natural Resources Summary**

The City of Wausau has abundant natural features that provide aesthetic and recreational benefits, but the prevalence of steep slopes, wetlands, floodplains, and shallow bedrock limit development opportunities. The City's four distinct seasons also enhance its outdoor recreation opportunities, but severe weather, natural hazards, and climate change affect the City's infrastructure, health, and financial resources. The City must balance these opportunities and treats as well as the protection of natural resources as development continues.

By focusing on development in areas already served by infrastructure, the City can increase its tax base and housing supply while minimizing the high financial and ecological impacts of adding new infrastructure. Infill development can also be used to incentivize brownfield remediation, which is discussed further in Chapter 6: Economic Development. Green Infrastructure can also be used to strategically offset the environmental impacts of new development by managing stormwater and sequestering carbon. Likewise, protecting environmental corridors ensures that some areas of the City remain in a natural state for outdoor recreation, stormwater management, and wildlife habitat.

The City can also monitor and respond to changing weather patterns to maintain its stormwater infrastructure and publicly owned land to manage the increase in heavy rainfall events and projected changes to wildlife and vegetation. This not only mitigates flood damage, but it also protects the City's groundwater and surface water supply.

Overall, the Wausau area is increasingly being known for its position as a “base camp” for a variety of outdoor recreation activities, especially skiing, mountain biking, gravel biking, curling, hiking, whitewater kayaking, and other forms of water-based and season-based recreation. Maintaining and enhancing these assets while enabling development that attracts residents and visitors enhances the City's overall quality of life.

### **Natural Resource Issues**

#### **Land Resources**

##### **Brownfields**

Cleaning up soil and groundwater contamination and other types of environmental hazards in the City of Wausau will foster redevelopment of certain properties and expand the City's tax base as well as increase the utilization of otherwise underdeveloped properties. Reusing the former industrial lands downtown along the river is a priority. Development in these areas also maximizes use of existing infrastructure and services, and it reduces new development in natural areas.



## **Development Constraints**

In some parts of the City, natural features such as shallow bedrock, steep slopes, and wetlands pose constraints that limit urban-type development. The higher cost of construction on steep slopes or in areas with high bedrock often reduces the development feasibility of these areas. As a result, these areas are often left undisturbed while land with fewer constraints around it is developed, which can result in inefficient land use patterns. As land prices increase, developers become more willing to take on the added expense of developing these more challenging sites.

## **Water Resources**

### **Water Quality**

As climate change and upstream development puts pressure on existing stormwater management facilities, managing runoff to the Wisconsin River and its tributaries while minimizing flooding impacts will continue to be a concern. Untreated runoff carries pollution and nutrients into waterways, impacting groundwater and wildlife habitat quality.

### **Wetlands**

Some relatively small, poor quality wetland areas in the City have limited or significantly delayed the type and scope of several proposed developments. The delays have been costly to both the developer and the City as significant time and other resources devoted to wetland issues have, nonetheless, resulted in the elimination of the wetland area.

### **Wisconsin River**

The Wisconsin River is a major asset to Wausau. It was recently designated as part of the Great Pinery Heritage Waterway, which is a National Recreational Trail. Continuing to improve the natural resources qualities of the Wisconsin River and the public's access to this waterway is a major community issue. Through the planning and implementation activities of the Wausau River Edge Commission, much has been accomplished but there is still work to be done.

## **Biological and Ecological Resources**

### **Conservancy Areas**

There are three large, very significant environmentally sensitive areas in Wausau that have not received the type of public protection from development that may be warranted. The wetland/floodplain complex of the Big Rib River, Little Rib River, and the Eau Claire River provides relatively undisturbed habitat for many species of wildlife in a near-urban environment. However, there are not any local programs established to protect these environmental corridors, and high density, urban-type development is continuing to encroach into these areas.

## **Greenhouse Gas Reduction and Resiliency**

### **Climate Change**

An increase in temperature and rainfall will impact the species that thrive in the area as well as the landscape's ability to manage stormwater. Additionally, it will shift demand for utilities as the number of days people use air conditioning or heat adjusts to changing temperatures. Finally, natural hazards like flooding, severe storms, and heat waves will impact City residents, especially those with limited resources.

## Goal, Objectives and Action Steps

### Natural Resources Goal:

The City of Wausau will continue to protect and enhance the quality of significant natural resources.

#### Objective A: Protect vulnerable natural resources.

1. Establish buffer areas between urban development and environmentally sensitive lands.
2. Engage in public education campaigns that will increase awareness of environmental issues and good stewardship practices.
3. Continue to require the use of sediment and erosion control best management practices for all new development and redevelopment projects.
4. Continue efforts to reduce soil erosion.
5. Work with Marathon County, adjacent communities, local conservation groups and the Wisconsin Department of Natural Resources to identify opportunities to acquire land or easements for park and public open space purposes in environmentally sensitive areas.
6. Consider adopting a tree preservation ordinance to restrict removal of mature trees and woodlands in the City.
7. Continue the street tree and park tree planting programs that have earned the City numerous “Tree City” awards.
8. Monitor, update and revise the construction site and erosion control ordinance to ensure that the latest best management practices have been included in the protection requirements.
9. Continue expanding diversity among native species while removing invasive species in parks, environmental corridors, and boulevards to improve the resilience of the tree canopy, plant communities, and wildlife habitat.
10. Continue to enhance and expand the City’s tree canopy by working with other agencies such as Marathon County and the Wisconsin Department of Natural Resources while reviewing and updating City policies, practices, contracts, and operations across City departments.
11. Maintain the City’s designations and affiliations such as Green Tier Legacy Community, Tree City USA, Bird City Wisconsin, and Wisconsin Local Government Climate Coalition.

#### Objective B: Protect and enhance surface water and groundwater resources.

1. Protect the quality of groundwater from all sources of pollution, including PFAS and pesticides.
2. Improve the quality of water in streams and in the storm sewer system that flows through Wausau and into the Wisconsin River.
- ~~3.—Update stormwater management requirements with current Best Management Practices (BMP). (Move to Chapter 5)~~
4. Develop and implement programs that will preserve and protect the wetland and floodplain complexes of the Big Rib River, Little Rib River, and Eau Claire River near their confluence with the Wisconsin River.
- ~~5.—Continue to implement elements of the City’s Wellhead Protection Plan including the Wellhead Protection Overlay zoning ordinance (Section 24.54 of the Wausau Municipal Code). (Move to Chapter 5)~~
6. Update, as necessary, and continue to enforce the shore land and floodplain zoning ordinances.
7. ~~Consider developing~~ Develop a program for restoring damaged or filled wetlands as soon as possible.
8. ~~Investigate the establishment of~~ Establish a wetland mitigation bank as a means of replacing wetlands that are impacted by public works, industrial development, or redevelopment projects as a top priority within the next decade.
9. Monitor wetlands on City-owned property for the presence of invasive plant species and develop a plan to control and/or eliminate them.
10. Work with the U.S. Army Corps of Engineers and the Wisconsin Department of Natural Resources to identify all navigable waters within the Long-Term (2050) City Growth Planning Boundary.
11. Work with Wisconsin Salt Wise to reduce the impacts of road salt on surface and groundwater resources

12. Implement green infrastructure where it is practical to manage stormwater and enhance wildlife habitat.
13. Expand education and alignment with City policies and practices to reduce salt and pesticide use.
14. Explore a variety of ways to reduce impervious surface, such as using alternatives to artificial turf or utilizing pervious pavement.
15. Explore options to provide greater allowance for native species compared to traditional lawns and/or reduction of pesticide use for residential and commercial property owners.
16. Convert lawn areas on City property to native species where appropriate.
17. Provide public education about the environmental benefits of native plantings and reduction of pesticide use.

**Objective C: Promote a sustainable, resilient, and resource-efficient community by reducing waste generation, expanding waste diversion practices, and supporting a transition to a circular economy that minimizes environmental impacts. ~~Manage solid waste and contaminants to limit their negative impacts.~~**

~~1.—Continue to promote and participate in annual spring roadside litter clean-up efforts.~~

1. Promote and educate about the benefits of a circular economy with the goal of eventually moving to zero waste.
2. Continue to provide recyclable solid waste collection service for City residents.
3. Provide a household hazardous waste disposal program for City residents that are cost effective in keeping these materials out of the sanitary sewer system, the storm water system and from being land spread.
4. Promote and educate about food waste reduction and composting including curbside composting pickup services.

**Objective D: Monitor and Respond to Climate Change Impacts**

1. The Sustainability, Energy, and Environment Committee (SEEC) will monitor emerging climate trends and programs or strategies that can be used to respond to climate issues.
2. New or upgraded infrastructure will be designed to handle more intense storms and extreme temperatures.
3. The City will continue to upgrade its fleets and facilities to meet clean energy goals stated in the City's 2023 Greenhouse Gas Resolution.