GALLATIN VALLEY SENSITIVE LANDS PROTECTION PLAN

Connecting our Landscape, Heritage, and Future on Common Ground

ADOPTION DRAFT NOVEMBER 2023

To view an online summary and interactive maps presented in this Plan, visit the Project Website at:

GALLATINVALLEYPLAN.BOZEMAN.NET

Letter from the Working Group Members

For the past 12 months, Working Group members have been providing valuable time and resources towards the completion of the Sensitive Lands Study, Interactive Model map and Recommendations. We thank the city and county officials who took initiative to make this work happen, and Logan Simpson for their expertise throughout the project duration.

We would like to note that the Recommendations highlighted in Section 4 are categorized based on our collective experience and expertise. We further look to the land use decision makers, officials, and planning staff who have more knowledge regarding the feasibility, sustainability, and legality of implementing these recommended tools. We hope these recommendations provide land use decision makers and the communities within Gallatin County with a sense of hope concerning the breadth of possibilities for balancing our growing county's needs with protection of lands essential for water quality and quantity, abundant fish and wildlife, healthy soils and more.

Tier 1 are recommended tools that we collectively agree are highest priority and most impactful in protection of sensitive lands, and are categorized by theme. Tier 2 tools, while beneficial, we believe are less impactful and included as additional tools.

We believe the strength in this project lies with the coupling of the Sensitive Lands Model mapping tool, and Plan document detailing recommendations. The model helps guide us to *where* we need to focus our efforts, and the Tier 1 recommendations answer the question of *how* we can best achieve our goal of protecting sensitive lands.

As with many great projects, ensuring that there is capacity and processes in place to maintain the usefulness of tools is key. The mapping model has vast potential to be regularly updated so that it accurately reflects priorities. We hope an adaptive management process will be implemented for updating the plan, recommended tools and model into the future.

Time is of the essence. We urge the municipalities and the County to act quickly by developing action plans using the Tier 1 recommendations to protect our remaining sensitive lands, in partnership with landowners, agencies, Tribes, non-governmental organizations and others. Gallatin County is consistently noted as the fastest-growing county in Montana and one of the fastest growing in the West. The values survey conducted as part of this process notes that three out of four people in the Bozeman area believe that the rate of growth and development is too fast, and that people are deeply concerned about the impacts of growth on water quality and quantity, and wildlife. If we are to preserve these important values, as well as our quality of life and heritage, we must protect and connect our remaining sensitive lands. We must do so quickly before they are lost forever, as well as the treasured wildlife populations dependent upon those lands. We are fortunate to live in the Greater Yellowstone Ecosystem, one of the last nearly-intact temperate zone ecosystems in the world. It is our responsibility to ensure that it remains so, for future generations and for all of the species who together make up this very special and rich part of the world.

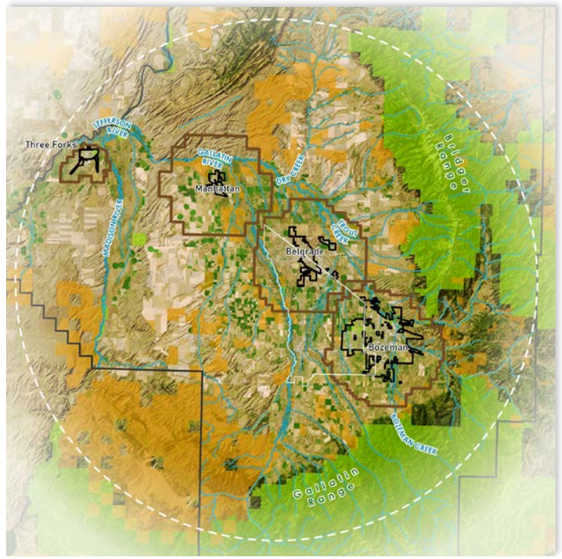
Sincerely,

Working Group Members

GALLATIN VALLEY
SENSITIVE LANDS
PROTECTION PLAN

Connecting our Landscape, Heritage, and Future on Common Ground

EXECUTIVE SUMMARY



The Sensitive Lands Protection Plan highlights sensitive lands identified through a robust GIS model and provides a menu of recommendations that can be used by agencies, non-profits, and landowners to protect the most sensitive resources.

The Gallatin Valley is the Study Area for the analysis and plan recommendations. The Plan recognizes that natural resources, from water courses to wildlife movements, extend beyond the Study Area boundary. The mapping relied on existing authoritative data sources.

The planning process was a collaborative effort between rural and urban residents, the City of Bozeman, and a Working Group of partners, including Gallatin County, other governing bodies, non-profits, and additional partners.

Chapter 1: *Our Planning Process* presents the public outreach, GIS modeling processes, and introduces the Sensitive Lands themes.

Chapter 2: *Our Community's Sensitive Lands Values* identifies common values across the Study Area based on the public outreach and recently adopted policies and plans.

Chapter 3: *Our Sensitive Lands* summarizes data collection, modeling process, and the outputs of the sensitive lands models.

Chapter 4: *Our Solutions* lists recommendations to guide future implementation of sensitive lands conservation and management.

Wildlife & Biodiversity

Connectivity

Agricultural Heritage

Water Quality & Quantity

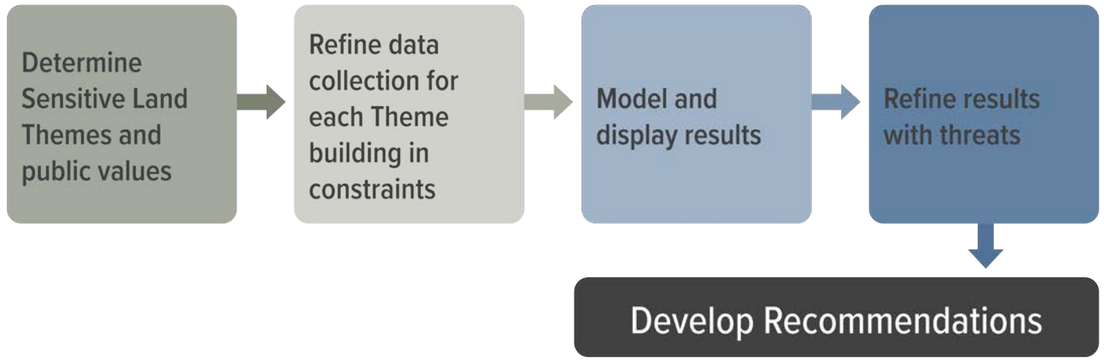
Collaboration and future action from willing agencies, partners, and constituents across the Valley is needed for successful Plan implementation.

The recommendations build off the science that was used to develop the sensitive lands models. Most recommendations provide benefits to multiple themes which results in an increase in benefit for protecting sensitive lands. The recommendations include a consolidated menu of solutions that various organizations, agencies, and/or partners can choose from to see actual change on the ground and implementation in policy documents. The recommendations may be implemented at various scales from large landscape measures to site specific actions to provide flexibility. Implementation methods for recommendations include development code updates, education, funding opportunities, incentives, policies, and legislative initiatives.

The execution of each recommendation will include additional public outreach if action is taken by one of the many project partners.

PROJECT GOALS

- *Secure the long-term ecological health of the region*
- *Create a regional model that identifies sensitive lands for protection of clean water, wildlife connectivity, and productive agriculture*
- *Recommend how to protect the most sensitive resources during unprecedented growth*
- *Identify benefits and best practices for development in harmony with the natural environment*
- *Facilitate dialogue between city, county, agencies, constituents, landowners, and developers*



The recommendations are organized first by the primary recommendations provided by the Working Group. These Tier 1 recommendations were prioritized by the Working Group as having the greatest impact on the protection of sensitive lands.

Tier 1 recommendations are further categorized into respective themes. Tier 2 provide additional recommendations that are or could be available. They are listed in alphabetical order. A handful of recommendations are identified as Tier 3, which need further evaluation on their impact to sensitive lands.

Tier 1 recommendation themes include: Broad Scale Protections, Incentive Based Conservation for Individual Parcels, Subdivision and Housing, Implementation Capacity, and Water Quality measures.

Education is important initially, no matter the level of implementation.

Community input was gathered throughout the project to shape the sensitive lands themes and values, inform data collection and model input, and shape recommendations.

gallatinvalleyplan.bozeman.net served as the community engagement hub throughout this project. Find the model, fact sheets, engagement summaries, and the Plan online!

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Acknowledgments

Working Group Members

Special Thanks!

In addition to the Working Group, our sincere appreciation and special thanks go to all community members for their commitment to articulating our values, helping collect data, and refining the recommendations.

Project Management Team

The project was facilitated by the City of Bozeman with a dedicated Project Management Team.

City of Bozeman

- Jeff Mihelich, City Manager
- Jon Henderson, Strategic Services Director
- Gail Jorgenson, GIS Program Manager, GIS and Asset Management Division
- Ali Chipouras, Sustainability Specialist, Sustainability Division
- Dani Hess, Community Engagement Coordinator, Communications & Engagement Division
- Takami Clark, Communications & Engagement Manager, Communications & Engagement Division
- Mayor Cyndy Andrus
- Deputy Mayor Terry Cunningham
- I-Ho Pomeroy, City Commissioner
- Jennifer Madgic, City Commissioner
- Christopher Coburn, City Commissioner
- Urban Parks & Forestry Citizen Advisory Board
- Sustainability Citizen Advisory Board
- Community Development Citizen Advisory Board

Additionally, staff from the Parks and Recreation Department, the Community Development Department, and the Public Works Department were involved in the Plan review.

Gallatin County

- Jennifer Boyer, Commissioner
- Zach Brown, Commissioner
- Scott MacFarlane, Commissioner
- Whitney Bermes, Gallatin County Communications Coordinator
- Sean O'Callaghan, Chief Planning Officer, Open Lands Coordinator
- Garrett McAllister, Senior Long Range Planner
- Christopher Scott, Senior Planner

Logan Simpson

- Jeremy Call
- Kristina Kachur Webb
- Ben Oesterling
- Aly Winchell
- Melissa Ruth
- Breece Robertson (Contractor)

Land Acknowledgment

We respect the lands we share with all living beings and systems – the plant world, the crawlers, swimmers, fliers, four legged, and two legged. We recognize the Indigenous peoples whose homelands, villages, and traditional use areas make up the study area of this project and who have lived on and cared for this land since time immemorial. We give thanks for their stewardship of this land throughout the generations and honor their ongoing connection and reciprocity with these sensitive lands in the past, present, and future.

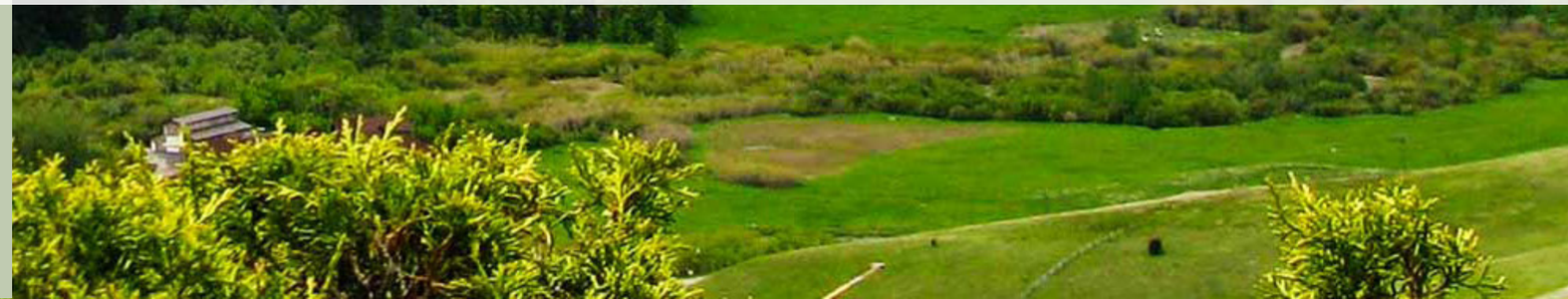
We recognize that threats to sensitive lands we identify in this plan are rooted in historic practices of forced displacement, cultural erasure, violence, and destruction of the food systems and lifeways of Indigenous people. We pledge to work towards reconciliation and building stronger relationships with Indigenous peoples based on mutual understanding and respect to protect and manage sensitive lands. Among the Indigenous nations of this region are the Séliš (Bitterroot Salish), Qlispé (Pend d'Orreille), Ktunaxa (Kootenai), Pikuni (Blackfeet), Tsistsis'tas (Northern Cheyenne), Apsáalooke (Crow), Anishinaabe (Chippewa), Nehiyawak (Cree), Metis, Nakoda (Assiniboine), A'aninin (Gros Ventre), Dakota, Lakota, and other Indigenous nations of the region.

WHAT IS A LAND ACKNOWLEDGMENT?

As this plan was developed the planning team met with several Indigenous knowledge-holders that have advised and consulted with us to develop a land acknowledgment as a first step in integrating Indigenous perspectives and ways of knowing into this work. It is important to recognize the history of the Gallatin Valley from an Indigenous perspective as traditional stewards of the land. For more tips on developing land acknowledgments, check out Recommendation 2.3 and this Guide to Land Acknowledgments.

Chapter 1:

Our Planning Process



Introduction

The Gallatin Valley Sensitive Lands Protection Plan (the Plan) came together through the work of many contributors, from gathering data from multiple sources to networking with partners and constituent to providing input on sensitive lands themes, model critieria, and soultion-oriented recommendations. The Plan articulates and attempts to resolve strategic choices necessary to "Connect our Landscape, Heritage, and Future on Common Ground," including conserving sensitive lands, balancing property rights; maintaining agricultural lands and industry; securing climate resiliency; managing tourist population and access; guiding development pressures; maintaining affordable housing; and funding stewardship and restoration across the Valley long-term.

This Plan is a science-based, politically-supported, and community-based approach that helps to meet the long-term conservation-development vision of the greater Gallatin Valley community. The visioning, resource mapping and modeling, and implementation relied on an interagency, consensus-based approach. The planning process was a collaborative effort between a Working Group of partners including the City of Bozeman, Gallatin County, non-profits, and other partners. As described throughout this document, collaboration and future action from agencies, partners, and constituents throughout the Valley will be crucial for successful Plan implementation.

The Sensitive Lands Protection Plan highlights sensitive lands identified through a robust GIS model, makes intangible values and natural assets more tangible, and recommends how to protect the most sensitive resources. Together we can enjoy the benefits of best practices of growing in harmony with the natural and agricultural environment.

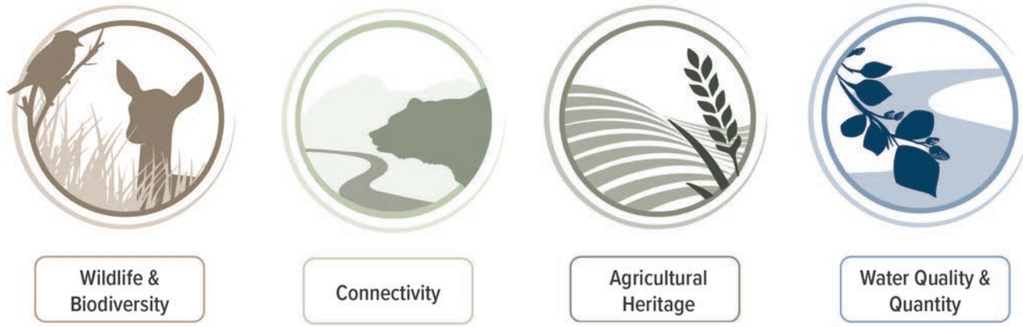
PROJECT GOALS

- *Secure the long-term ecological health of the region*
- *Create a regional model that identifies sensitive lands for protection of clean water, wildlife connectivity, and productive agriculture*
- *Recommend how to protect the most sensitive resources during unprecedented growth*
- *Identify benefits and best practices for development in harmony with the natural environment*
- *Facilitate dialogue between city, county, agencies, constituents, landowners, and developers*

Gallatin Valley is an inspiring landscape rich in human and natural history, home to abundant wildlife, and supporting world-class outdoor recreation opportunities. Outside of the City of Bozeman, Belgrade and the Valley's smaller communities is largely a working agricultural landscape that provides critical habitat and movement corridors. Many of these special places are "Sensitive Lands," or lands that are susceptible to negative impacts from the built environment and its residents that are necessary to support a healthy environment and public wellbeing. This Plan includes a comprehensive model to quantify habitat and corridors between urban and natural areas throughout the Valley while also considering the value of working agricultural lands and other sensitive lands. Results of the modeling informed the list recommendations to guide decisions about land use and management in the Gallatin Valley.

WHAT ARE SENSITIVE LANDS?

Sensitive lands include lands that are susceptible to negative impacts from the built environment and its residents that are necessary to support a healthy environment and public wellbeing.

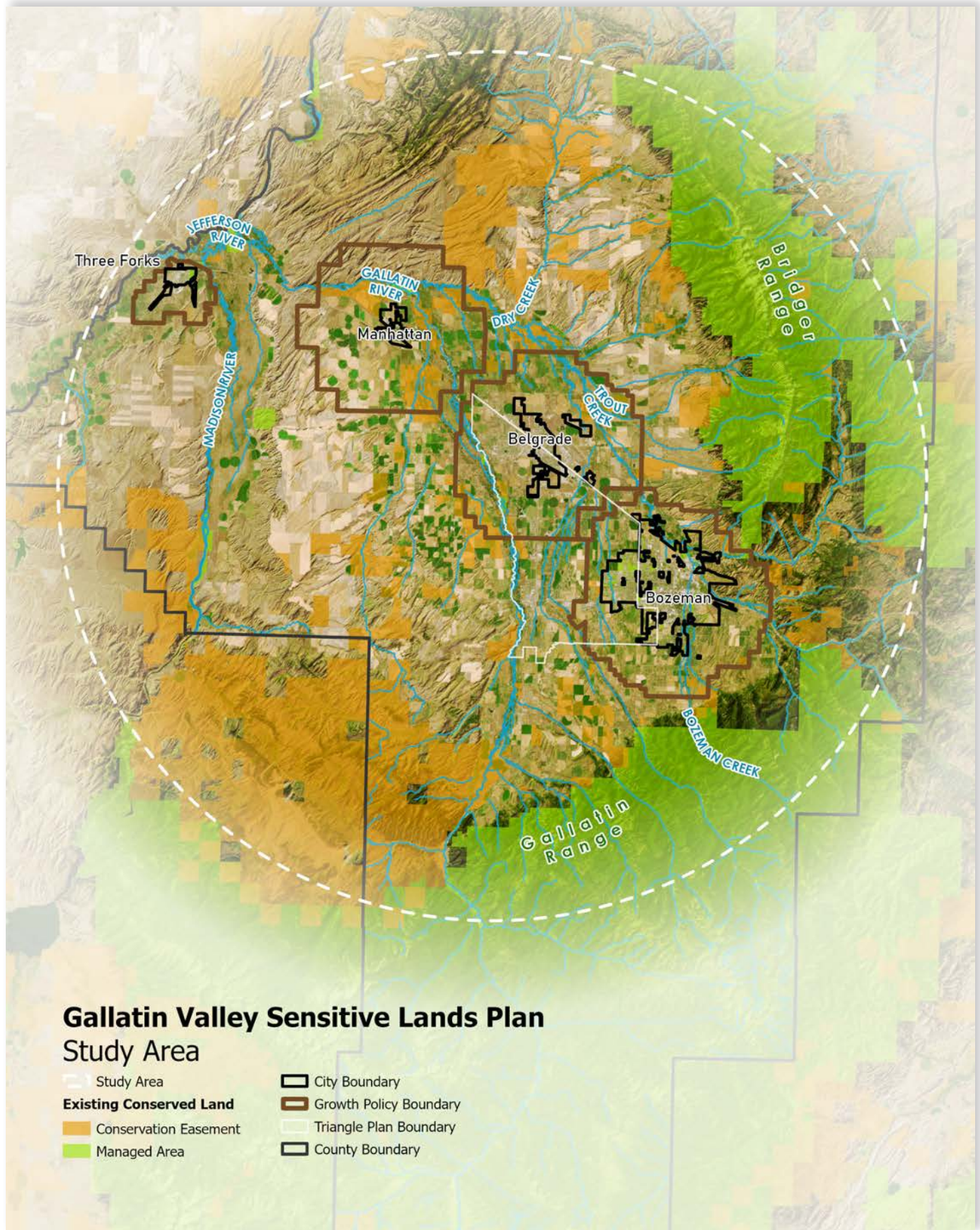


This Sensitive Lands Protection Plan provides a road map to how we can manage growth while conserving finite natural resources in the Gallatin Valley. Residents of the Gallatin Valley are dedicated to securing the long-term ecological health of the entire region. A strong connection between clean water, abundant wildlife, productive agriculture, and cultural heritage has supported a high quality of life for generations. As the area continues to experience unprecedented growth, a regional approach to protecting sensitive lands can help conserve high-quality habitat into the future. The Sensitive Lands Protection Plan is needed to define a unified vision, map critical resources, leverage common goals, and create support for future policy development, public education, funding, and implementation.

This planning effort respects and does not infringe upon any valid and existing private property right nor change regulations affecting private property. It also does not identify areas for land acquisition but rather identifies recommendations for future conservation, protection, and management of sensitive lands in cooperation with willing landowners and partners.

The Gallatin Valley Study Area

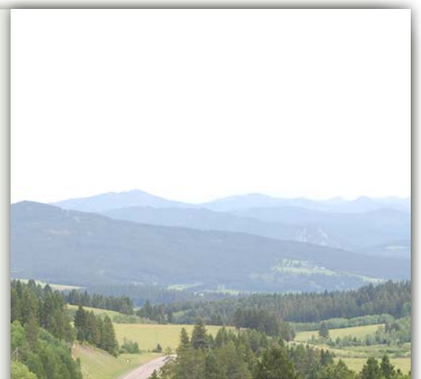
This project focuses on the Gallatin Valley. The circular boundary is not a hard line, but a way to focus the analysis and discussion of plan recommendations. The Plan recognizes that natural resources, from water courses to wildlife movements, extend beyond the Study Area boundary which is helpful to understand the context of sensitive lands. While the Study Area shows small areas of neighboring counties, in some cases data is more complete for Gallatin County alone. As a result, the sensitive lands mapping is more accurate and applicable to Gallatin County. The study relied on existing authoritative data sources and no field data was collected during the study. Detailed study of specific species or areas of interest were beyond the scope of this project. While neighboring counties are shown, the recommendations in this report by no means directs, requires, or legally binds any agency to action. However, this Plan should be used as a reference document by any agency or organization as they see fit.



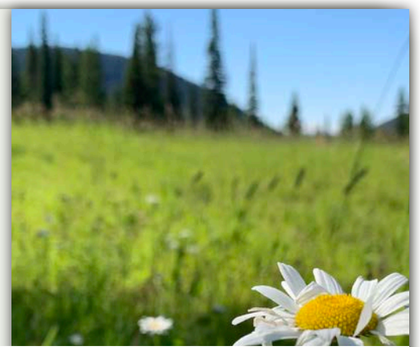
How to Use This Plan

Chapter 1*: Our Planning Process* presents the public outreach, GIS modeling processes, and introduces the Sensitive Lands themes.

Chapter 2: *Our Community's Sensitive Lands Values* identifies common values across the Study Area based on results from the public and constituent outreach and recommendations of recently adopted policies and plans.



Chapter 3: *Our Sensitive Lands* summarizes data collection, modeling process, and the outputs of the sensitive lands models.

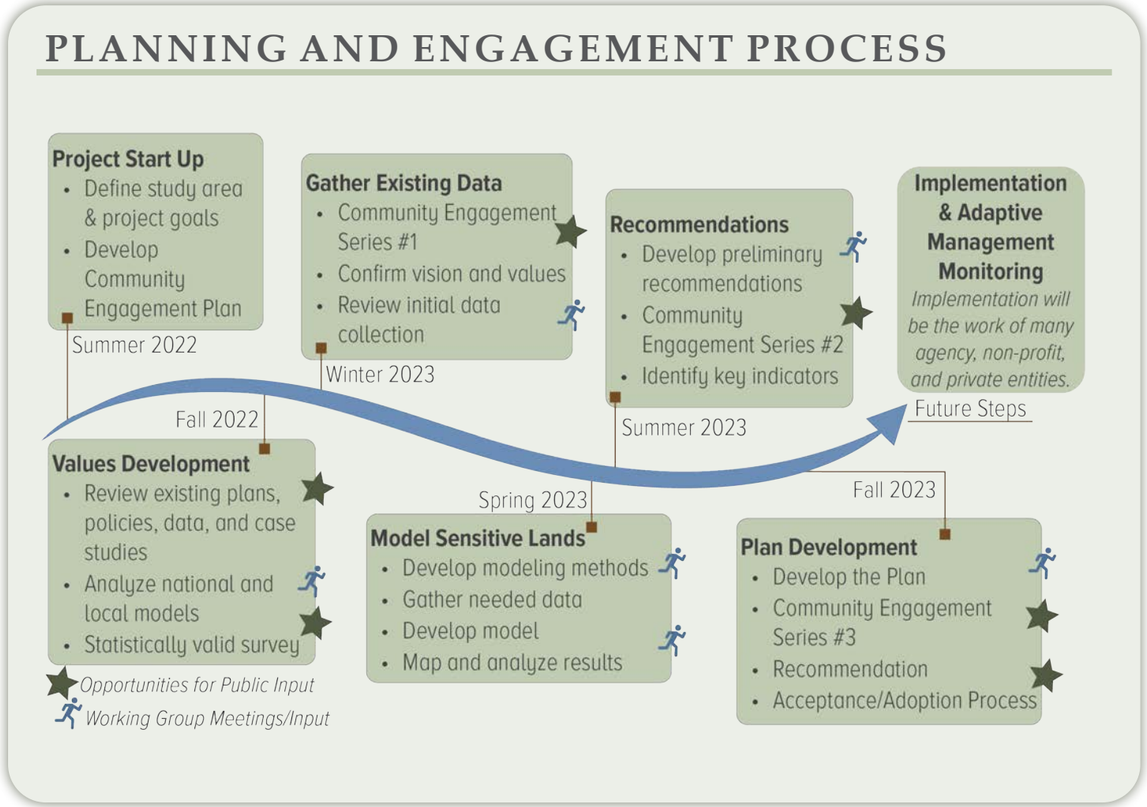


Chapter 4: *Our Solutions* lists recommendations for development code updates, education, funding opportunities, incentives, policies, and legislative initiatives to guide future implementation of sensitive lands conservation and management.

Community Engagement Process

The Sensitive Lands Protection Plan is grounded in the values expressed by community members in the Gallatin Valley. The process to develop the plan included many ways for the community to weigh in, including visits to high school and university classrooms, meeting with landowners and experts in many different fields, engaging Indigenous knowledge-holders, and surveying residents across the study area in person and online. Community input helped define the values and priorities that shaped the sensitive land themes, identify data that informed the model, and refine the recommendations. A deliberate and sustained effort helped the community fully understand and identify needs and solutions.

The engagement process involved six stages. Throughout the process the project website was used to communicate project updates, gather feedback, and share interactive maps that allowed the community to learn more about sensitive lands across the Valley.



Community Engagement Goals

The City's Engage Bozeman framework helped ensure community input was centered in plan development. Given the wide reaches of the study area, "community input" includes that of residents, landowners, organizations, staff, and agency officials from across the Gallatin Valley. With this approach, we sought to:

1. Consult the community to gather information on stressors to our existing sensitive lands, prioritize categories of sensitive lands, and values that should be reflected in the vision and goals.
2. Involve the Sensitive Lands Working Group who helped shape this effort from the beginning and were instrumental in establishing criteria, developing and evaluating alternatives, and developing recommendations.
3. Represent the entire community, including a range of interests through outreach with key constituents and the general public.
4. Inform the community on the initiative and input opportunities.

Sensitive Lands Working Group

The Working Group of technical experts with diverse interests guided the plan development. The role of the Working Group was to provide guidance on the sensitive lands methodology, approve model inputs, review and interpret model results, and be a sounding board for plan recommendations. As a team, they combined their individual expertise to work towards a common goal and extended outreach to their community constituents. The Project Management Core Team facilitated regular meetings with the Working Group, including workshops where experts took a deep dive into specific topics.

Additional input was received from the City of Bozeman Sustainability Board, Urban Parks & Forestry Board, and the Community Development Board, as well as the Gallatin County Commission and the Planning Coordination Committee throughout the planning process.

Public Outreach Tools

The public provided feedback to the Working Group and staff through an in-depth Valley-wide survey and multiple public events hosted in different locations within the study area. We leveraged county-wide communications tools such as newsletters, print and digital news media, social media, and direct mail. Combined results are presented in Chapter 2, Our Community's Sensitive Lands Values.

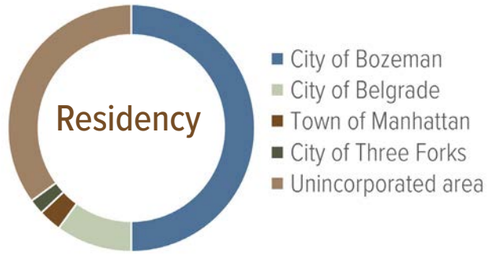
Statistically Valid Valley-wide Survey

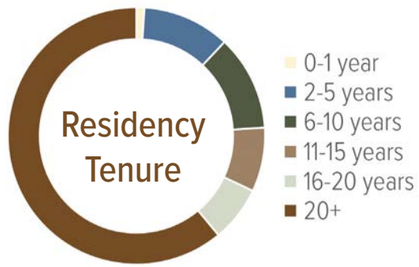
- Distributed to a sample 3,500 homeowners in the Study Area
- 590 total responses. Characteristics of survey respondents are presented below.

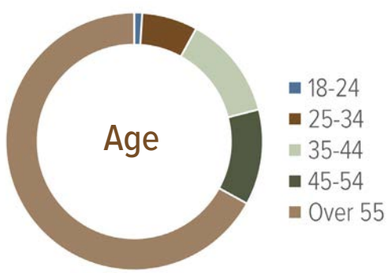
Goals

- Learn about residents' values from across the study area

See Appendix B: Statistical Valid Survey Report for complete results and information







Constituent Interviews

- We gratefully acknowledge many individuals and groups who are invested in improving sensitive lands outcomes in Gallatin Valley. The organizations and individuals listed below were interviewed early in the process to provide the team input on Gallatin Valley's history, best available GIS data, research reports, and helped articulate public interests.

PROJECT CONSTITUENTS

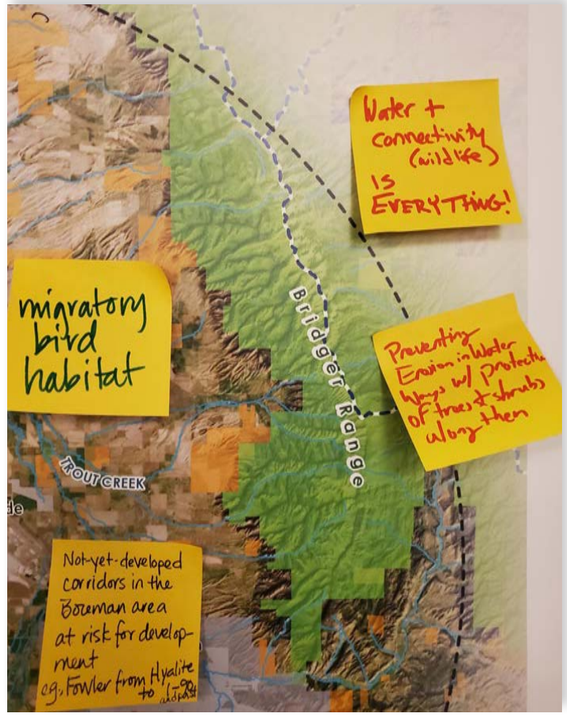
- *Association of Gallatin Agricultural Irrigators*
- *Bozeman Community Development and Parks and Recreation Department*
- *Bren School of Environmental Science & Management at the University of California, Santa Barbara.*
- *Buffalo Nations Food System Initiative*
- *Center for Large Landscape Conservation*
- *Conservation District Supervisor/aquatic consultant*
- *Future West*
- *Gallatin County Board of Commissioners*
- *Gallatin County Open Lands*
- *Indigenous knowledge-holders*
- *Landowners*
- *Montana Department of Revenue*
- *Montana Land Reliance*
- *Montana Natural Heritage Program*
- *Montana State Library*
- *Montana State University – Ecology, Land Resources and Environmental Sciences, Earth Sciences, Health and Human Development*
- *Native Nexus*
- *The Nature Conservancy*
- *U.S. Geological Survey*
- *University of Montana's Spatial Analysis Lab*

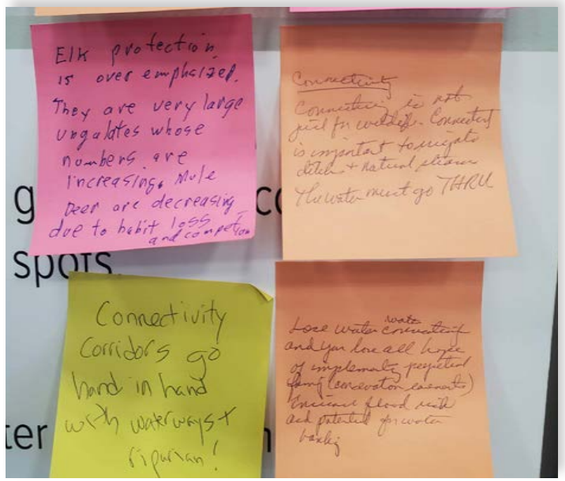
Meeting #1 (January 2023, Belgrade)

- 70 attendees
- Comments submitted via online tool

Goals

- Inform the broader public of the Plan and planning process
- Communicate the need for change
- Confirm vision and values
- Enlist participation in providing input throughout the project and adding priorities to shape the model data
- Share next steps





Meeting #2 (July 2023, Bozeman)

- 52 attendees
- 19 commenters on the questionnaire

Goals

- Share Sensitive Lands Mapping Results
- Gather input on potential recommendations

Meeting #3 (October 2023, Four Corners)

- ## virtual meeting attendees
- ## commenters on draft plan
- ## total comments

Goals

- Premier the Draft Plan for the Public

Themes

Sensitive lands can be defined in several ways. Four broad themes were identified early in the process, based off previous planning efforts (as identified in Chapter 2), current issues related to protecting sensitive lands in the area, Working Group visioning, and community input. These themes shaped the mapping model and protection recommendations. As evident in the model results in Chapter 3, there is overlap and symbiosis between each of the four themes: biodiversity relies on water quality and connected landscapes, and agricultural heritage integrates waterways such as ditches, for example. The themes are briefly described here with additional details, including the data inputs and model outcomes, presented in Chapter 3.

Wildlife & Biodiversity: Sensitive lands provide habitat for wildlife and biodiversity that are essential for preserving the Greater Yellowstone Ecosystem (GYE). Wildlife relies on the Gallatin Valley for food, shelter, reproduction, and critical winter range. All plants and wildlife, especially keystone species, require healthy and cohesive habitats on these lands.

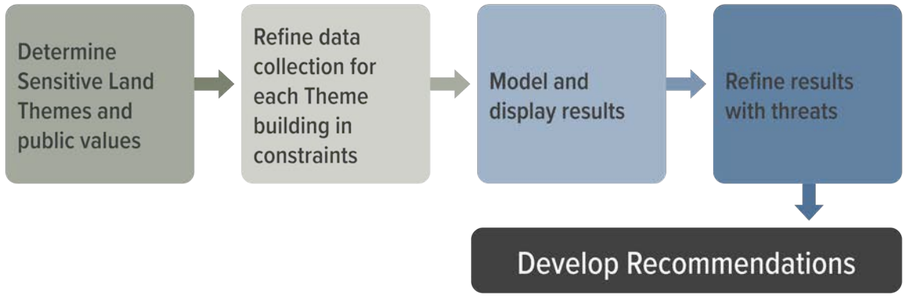
Agricultural Heritage: Agricultural lands are critical for supporting food and livestock production, which plays an important role in the Gallatin Valley's agricultural heritage and in supporting a robust local food economy. Working farmlands and ranches provide scenic views, community separation, and openness that help maintain the unique sense of place. Agricultural lands provide ecosystem services, wildlife habitat, and migration pathways, especially to wintering big game.

Connectivity: Connected and protected linkages between the mountains, foothills, and plains facilitate vital ecological interactions and allow for wildlife movement to food, shelter, reproduction, clean water, and critical winter ranges.

Water Quality and Quantity: Water systems underly all other themes because natural water features (wetlands, riparian areas, lakes, streams, and rivers) provide critical habitat, clean drinking water, and connectivity for aquatic species and wildlife populations. Irrigation infrastructure also provides value to the land in the form of water delivery for working farms and ranches and groundwater recharge that supports the health of the entire ecosystem.

Process

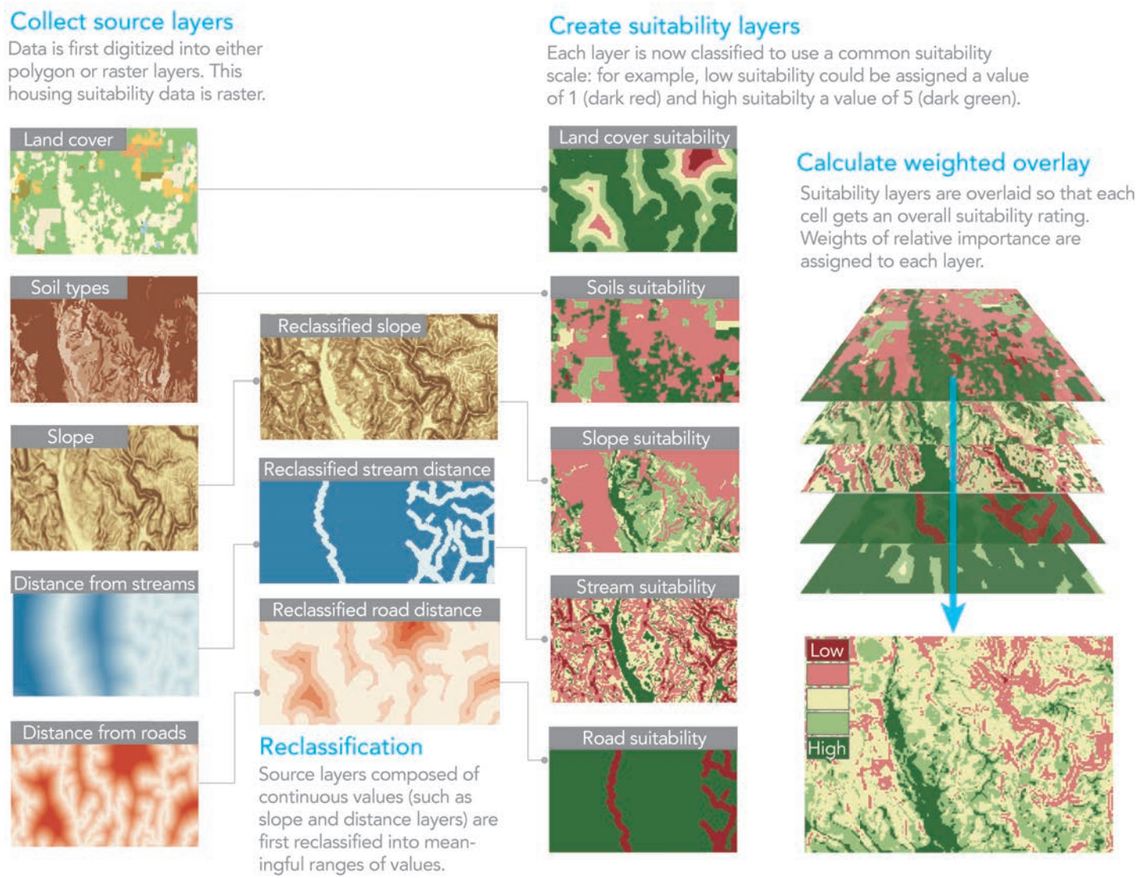
The Sensitive Lands Protection Plan used a community-based, data-driven process to identify sensitive lands values, map critical resources related to those values, and then develop recommendations to assist local governments and their citizens, non-profits, and even state and federal governments to achieve shared goals for conservation. Future recommendations and responsibility of implementation will be shared with all regional partners. Geographic Information System (GIS) modeling was used to identify sensitive lands for each of the four themes. These models can be used by anyone – public or private – through an interactive online platform to inform other planning processes as well.



What is Modeling?

Geographic Information System (GIS) is a software used to model and visualize geospatial data. Four models were created with GIS through a suitability analysis– one for each of the sensitive lands themes. Each model combines various data layers, reclassifies values, and defines weights for sensitive lands criteria. A common scale was defined by reclassifying relevant data attributes, in which high or low values highlight more or less important features for sensitive lands. The scoring for sensitivity was then mapped to help visualize critical areas.

Additional details on the modeling development, inputs, and outcomes are outlined in Chapter 3.



Example of a GIS suitability analysis. Additional detail on the following pages identifies the specific layers used for each sensitive lands model.

Chapter 2:

Our Community's Sensitive Lands Values

Why is This Plan Needed?

Significant efforts have been made by many agencies, businesses, and individuals to cultivate and maintain outdoor lifestyles, strong environmental ethics, and economic development in Gallatin County. On the heels of the Gallatin County, Bozeman, Manhattan, and Three Forks growth policies, which underscored public concern for conserving wildlife and wildlife habitat, now is a critical time to assess and proactively protect the values that long-term residents and newcomers cherish.

"This plan is needed around here before it all disappears."
-Survey Respondent

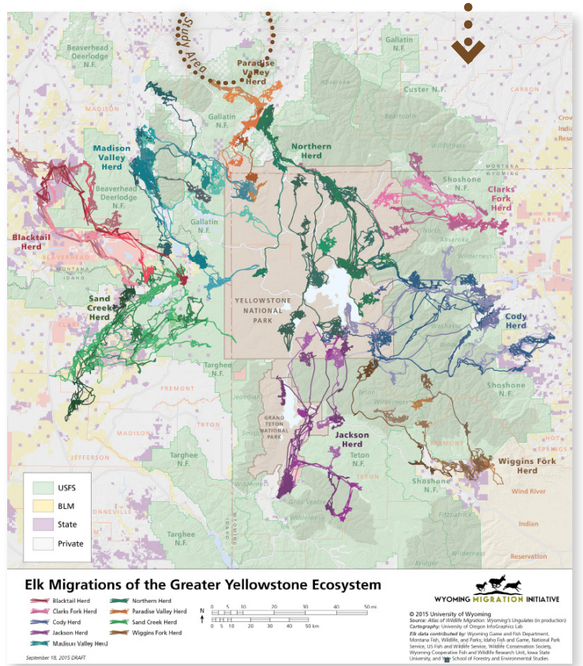
The Gallatin Valley is facing unprecedented growth in population, skyrocketing housing prices, and expanding tourism. Recreation demand is seemingly infinite, limited only by the supply of publicly accessible areas and the tolerance of crowded outdoor experiences. This growth has mobilized support for preservation of wildlife corridors and working agriculture, mitigating conflict between vehicular traffic and wildlife, siting and designing recreational facilities with wildlife in mind, and protection of scenic views. It is clear that continuing the current course will result in significant habitat fragmentation, displacement of wildlife, and loss of quality of life - ultimately diminishing the sense of place that makes the Gallatin Valley a distinct and valuable landscape.

There are multiple reasons why accepting the status quo or "doing nothing" is unacceptable and conserving sensitive lands for their intrinsic value, as well as future generations, is imperative now:

- **Our reliance on the Greater Yellowstone Ecosystem's multiple services:** The health of all plant, animal, and human inhabitants of the Valley relies on a resilient, connected, and intact ecosystem for clean water, local food and pollination, and quality of life. Access to these landscapes provides benefits to many, including physical, cultural, and emotional wellbeing, outdoor recreation, and connection with the land and water that sustains our communities and economy. A plan is needed to help balance recreation, conservation, development, and housing affordability as the community grows.

Gallatin County is the fastest growing county in Montana - 20% faster than the next fastest growing county.

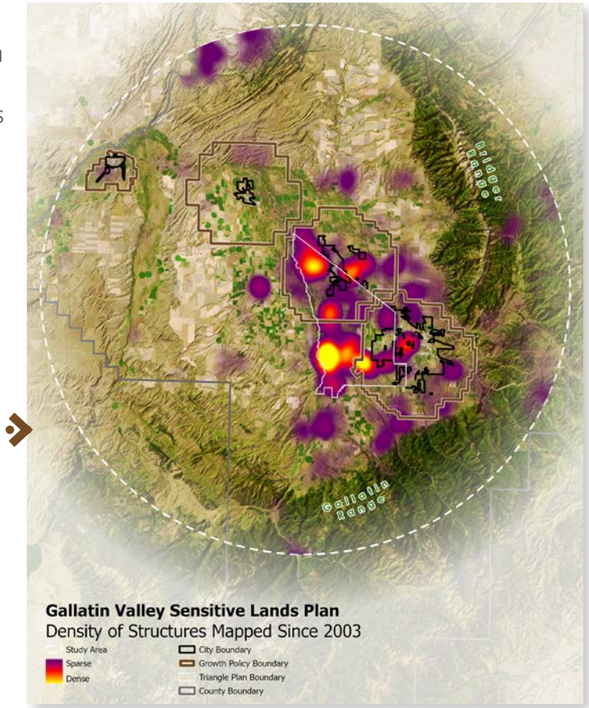
- **Shaping the future of Greater Yellowstone:** The Greater Yellowstone Ecosystem (GYE) is one of the largest nearly intact temperate-zone ecosystems in the world. Much of the Gallatin Valley is undeveloped or agricultural lands which provide habitat and movement corridors essential to GYE needs. Scientific studies of the GYE have reinforced that the environmental processes supporting biodiversity and wildness require habitat connectivity corridors for species migration and dispersal. Additionally, these processes require a range of habitats that can be resistant and resilient to large-scale disturbance such as fire, insects and disease, invasive species, drought, or floods, events likely to be exacerbated by climate change. **The GYE is one of the only areas in the world that continues to have the biodiversity and ecological integrity that is important for preventing the extinction of species on the planet.**



- **Wildlife knows no boundaries:** Wildlife relies on habitat and migration corridors throughout the Gallatin Valley for food, shelter, reproduction, and critical winter range. Their survival depends upon the region's continued ecological integrity.
- **Unprecedented growth:** Land development and recreation demand are at unprecedented levels and Gallatin County is the fastest-growing county in Montana. Population growth continues to increase with 71% population growth in the last 20 years, over 20% more than the next fastest growing counties in Montana (Gallatin County Growth Policy 2023). Additionally, part-time residents and tourist accommodations have added to the changing landscape.
- **Rocketing recreation:** The COVID-19 pandemic further accelerated demand for healthy lifestyles, mental health, and time in nature. Recreation has intensified throughout the year and summer and winter tourism peaks have continued to grow. Recreation trends now include activities around the clock, such as night running and climbing. There is also a noticeable increase in off-leash dogs on public lands which contribute to wildlife disturbance along with new technologies such as drones. Montana's outdoor recreation economy contributed 4.4% of the state's GDP, the second highest outdoor recreation contribution of any state across the U.S. (Bureau of Economic Analysis).

Montana's outdoor recreation GDP contribution is the 2nd highest in the U.S.

- **No unified regional plan:** Development decisions are isolated from one another and often conflict with the big game migration, land conservation and restoration efforts of other agencies and non-profits. A consolidated regional planning approach provides local governments and partners with resources and direction that they otherwise do not have.
- **Innovative tools:** We can learn from science, as well as the hard lessons learned from the Salt Lake Valley, Colorado Springs, and many other metro areas where big game migrations no longer occur due to human development and associated activities, to develop more impactful strategies for conservation.



Source: Gallatin County. Note this map only includes data tracked by Gallatin County and does not depict new structures within city limits.

- **Current development patterns:** Sprawl and large lot rural developments increase the cost of community services (emergency services, streets, water/wastewater, etc.), impacts noise and air pollution, and consume greater portions of the landscape per house. From 1970-2018, 95,680 acres were converted to housing in Gallatin County. Since 1990, 34% of homes built in Gallatin County have been on large lots of more than 10 acres (Headwaters Economics).
- **Conservation is changing:** Today there are more opportunities, support, science, and funding to conserve landscapes for recreation and community health closer to home, as well as for wildlife movement and food production. Providing for access that is equitable and inclusive is at the forefront of many conservation efforts.
- **Available funding:** Federal, state, and local dollars are available like never before to chart an equitable and resilient future together.

1 in 3 homes built in the last 30 years have been on lots greater than 10 acres.

Focusing Conservation Efforts

Of the 1,685,617 acres of land in Gallatin County, 53% is in private ownership. The Study Area includes more than 349,000 acres of managed public lands. Of the 886,074 acres of private land in Gallatin County, nearly 130,000 acres are placed under voluntary conservation easement. Therefore, the focus of this plan is the remaining unconserved lands throughout the Gallatin Valley – both private and public.

The focus of this plan is on the remaining unconserved lands throughout the Gallatin Valley.

Water is necessary to support "beneficial uses," including fish and wildlife habitat, drinking water, recreation, and irrigation. Water's ability to provide these beneficial uses is based on how the water moves through our watershed. Therefore, we value sensitive lands that treat pollution, naturally store water, mitigate floods, and provide greater fish and wildlife habitat and biodiversity. And in doing so, provide resiliency to natural disasters and changing climate.
- Lilly McLane, Gallatin Watershed Council

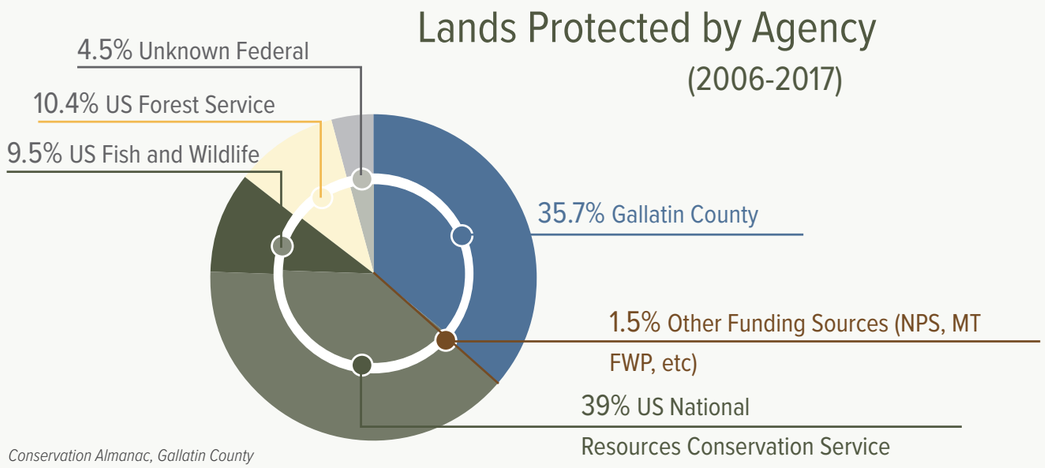
CONSERVATION EFFORTS IN GALLATIN COUNTY

886,074 Acres of Private Land in Gallatin County

of Land in Gallatin County in Private Ownership

142,431
(16% of private lands)

Acres under voluntary conservation easement



Conservation Almanac, Gallatin County

Charting the Way for Open Space

In 2018, following successful bond measures in 2000 and 2004, Gallatin County voters passed the Open Space Levy that allows up to 4.5 mills for open space conservation, with .5 mills being transferred to parks fund for capital improvements and maintenance. Conservation Projects (3.25 mills) support the purchase of land and conservation easements to conserve farm and ranch lands, provide recreation, protect water quality of streams and rivers, manage growth, and protect wildlife areas. Other Eligible Projects (0.75 mills) are capital improvements and maintenance projects like trails upkeep that support the purpose of the open space levy.

"The Gallatin County Open Lands Board seeks to preserve open space lands for the enjoyment of present and future generations. The diverse acreage includes rich agriculture lands, serene mountain settings, parks, unique wildlife habitats, streams and lakes, historic areas and trail corridors. A prime goal of the Open Space Program is to preserve and enhance the County's uniqueness: its striking mountain vistas, rolling agriculture plains, fish-filled streams and abundant wildlife."
- Sean O'Callaghan, Open Lands Coordinator and Planning Director

For example in 2022, the Open Space Levy collected nearly $1.8 million in revenue from property taxes and the Board of County Commissioners allocated $2.4 million towards Conservation Projects and Other Eligible Projects. The Levy supports open land protection primarily through funding conservation easements submitted by project applicants. The Gallatin County Open Lands Program has partnered with willing landowners and land trusts to conserve 62 properties totaling over 52,000 acres to date. Approximately 360 acres were conserved per year for the 5-year period 2012-2017. Gallatin County also manages the Gallatin County Regional Park, a 100-acre regional open space in the City of Bozeman which serves as a public recreation area. As land prices escalate, fewer acres will be able to be conserved without a proportional increase in funding.

WHAT IS A CONSERVATION EASEMENT?

A voluntary in perpetuity legal agreement between a landowner and a land trust or government agency that permanently limits uses of the land to protect its inherent ecosystem values. It allows landowners to continue to own and use their land, and to sell or pass on the property to heirs.

Guiding Plans

Each local governing body develops and adopts plans to guide growth within their jurisdiction. Together these plans offer steppingstones for the Sensitive Lands Protection Plan to build from. This Plan builds off these existing policies and finds common ground among existing plans/policies across communities within the Valley.

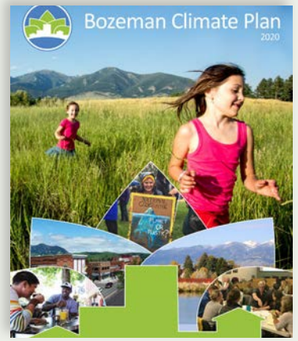
Plan	Year Adopted
Gallatin County Growth Policy	2021
City of Bozeman Community Plan	2020
Triangle Community Plan	2020
Envision Three Forks	2022
City of Bozeman Climate Vulnerability and Resiliency Strategy	2019
City of Bozeman Climate Plan	2020
City of Bozeman Parks, Recreation and Active Transportation Plan	2023
Triangle Area Trails Plan	2021
City of Belgrade Parks and Recreation Plan	2019

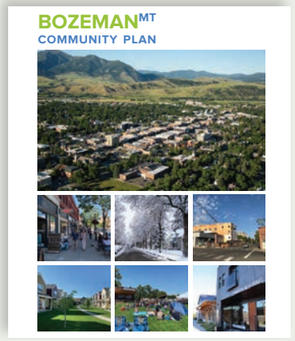
COMMON THEMES IN ADOPTED AND RELEVANT PLANS

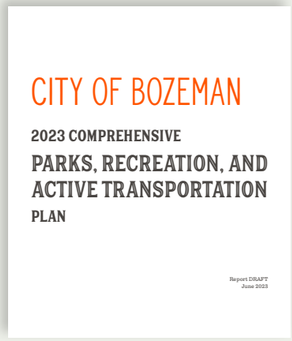
- *Managing and Conserving Water Resources*
- *Maintaining Agricultural Heritage*
- *Increased Development Density*
- *Open Space Protection*
- *Parks Planning*
- *Thoughtful Infrastructure Planning*
- *Soil Health*
- *Air Quality*
- *Native Plants*
- *Fish and Wildlife*
- *Movement and Migration*
- *Recreational Opportunities*
- *Viewshed Protection*
- *Climate Change*
- *Regional Coordination*
- *Indigenous Involvement*
- *Public Health and Safety*
- *Respect for Private Property Rights*
- *Efficient Service Delivery*
- *Vibrant and Resilient Neighborhoods*
- *Responsible and Reliable Clean Energy Supply*
- *Diverse and Accessible Transportation Options*
- *Comprehensive and Sustainable Waste Reduction*
- *Regenerative Greenspace, Food Systems, and Natural Environment*

PLANNING FOR RESILIENCY IN BOZEMAN

The City of Bozeman recently adopted a long-range Growth Policy, a Climate Plan, and a Parks, Recreation and Active Transportation Plan that work together to support a more resilient community. Well-planned, walkable neighborhoods combined with support for local food systems and conserving water resources emphasize the relationship between nature and the built environment.







Other Sources

Similarly, publications and resources from a variety of sources also provide important information and data related to the plan and informed the model in Chapter 3 and recommendations in Chapter 4. Learn more about each of these Adopted and Relevant Plans, as well as Publications for Consideration, in Appendix A: Literature, Policy, and Case Study Review.

Learn more about Adopted and Relevant Plans in Appendix A.

Plan	Year Adopted
Critical Lands Study of Bozeman Area	1997, Not Formally Adopted
Montana Department of Fish, Wildlife and Park's Fish and Wildlife Recommendations for Subdivision Development	2012
Montana State Wildlife Action Plan	2015
USFS Custer Gallatin Forest Plan (2020)	2020
Online Publications by Montana Natural Heritage Program	N/A
Gallatin County Natural Resource Long Range Plan (2019- 2024)	2019

Values Summary

Gallatin Valley residents are strongly supportive of respecting sensitive lands – with water and wildlife as primary reasons why sensitive land protection is important. Clean drinking water and water for healthy fisheries, recreation, and biodiversity ranked toward the top. Water for native fish populations, farming and ranching, and resiliency to natural disasters and changing climate also are important values.

CONSERVATION PERCEPTIONS ACROSS MONTANA

Three out of four *(74%) people in Montana rate of growth and development is too fast*

There is ***very strong support*** *for efforts that would aid migrating wildlife*

87% *of Montanans (63% strongly)* ***support constructing wildlife crossing structures****, such as over-passes or under-passes across major highways that intersect with known, concentrated migration routes*

86% *of Montanans (54% strongly) support providing* ***incentives to private landowners like ranchers who voluntarily agree to conserve some of their land*** *in migration routes as wildlife habitat*

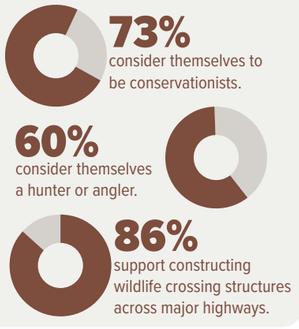
81% *of Montanans (49% strongly) support* ***identifying large blocks of existing public lands that would be managed and conserved****, with an emphasis on conserving wildlife migration routes*

87% *of Montanans say that issues involving* ***clean water, wildlife, and public lands are important*** *in deciding whether to support an elected official (2022)*

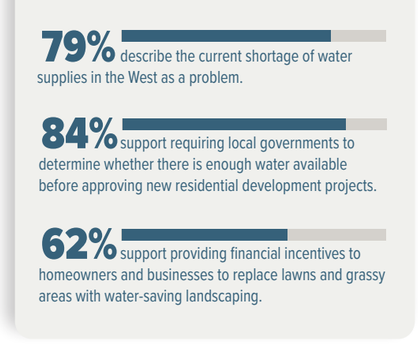
77% *of Montanans support a national goal of protecting 30 percent of America's lands and waters by 2030, up from 71% in 2022*

82% *of Montanans support creating* ***new national parks, national monuments, national wildlife refuges, and tribal protected areas,*** *up from 73% in 2022*

CONSERVATION



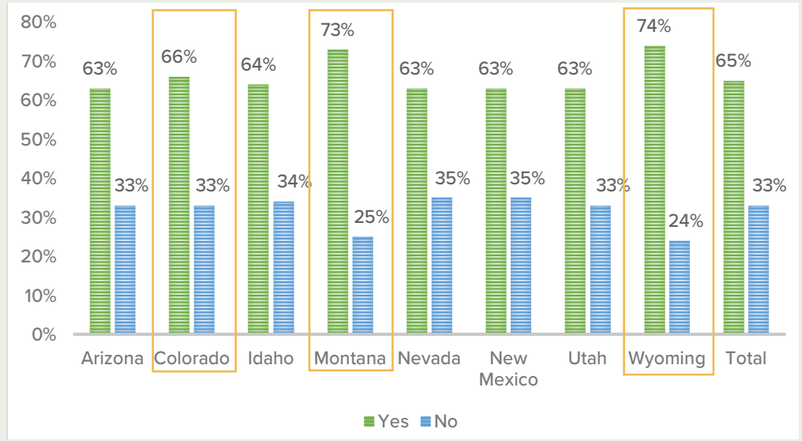
WATER & DROUGHT CONCERNS



PROTECTING 30X30

Sources: Montana Results of Colorado College's State of the Rockies 2023 Conservation in the West Polls:
University of Montana 2022 Voter Survey on Public Lands

MOST WESTERN VOTERS CONSIDER THEMSELVES CONSERVATIONISTS. MONTANA AND WYOMING ARE THE MOST LIKELY TO FEEL THIS WAY, WITH NEARLY THREE-QUARTERS LABELING THEMSELVES AS SUCH.



Sources: Montana Results of Colorado College's State of the Rockies 2023 Conservation in the West Polls:

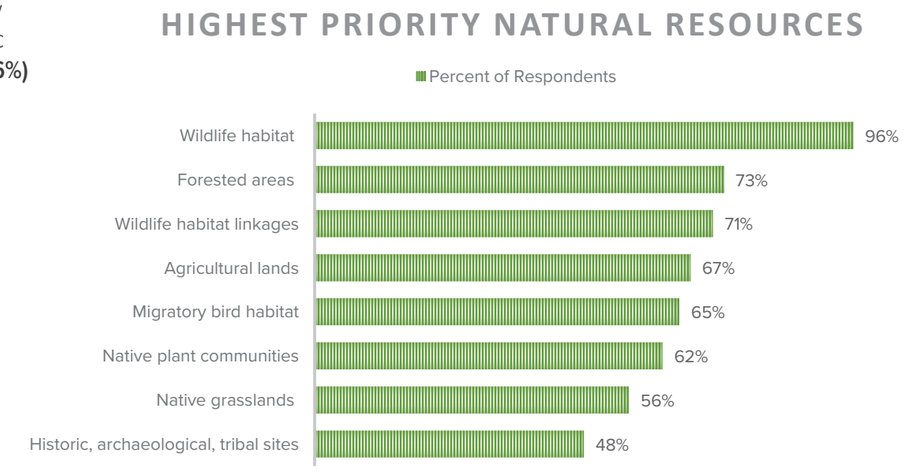
Gallatin Valley Statistically Valid Survey

As part of the community engagement process for this Plan, a statistically valid survey was conducted to survey a random sample of 3,500 people who own homes in the study area (See Appendix B for the complete Report). The survey found that Gallatin Valley residents rated the importance of natural resources as follows (on a scale of 1 = lowest priority, 5 = highest priority. The percent represents the combined responses of 4 and 5).

The survey also asked the question, "*Why do you think sensitive land protection is important to the Gallatin Valley?*" From the list of twelve issues posed to area residents, the top three results were as follows.

- Protect water quantity and quality for aquatic life and recreation **(56%)**
- Maintain the Valley's renowned wildlife populations and biodiversity **(52%)**
- Provide water quality and quantity for local residents **(51%)**

HIGHEST PRIORITY NATURAL RESOURCES



Statistically Valid Survey Results by Theme

Wildlife and Biodiversity

Residents are most interested in protecting deer, elk, moose, other ungulates, native fish, and aquatic species. Wetlands and waterfowl production areas are important for biodiversity. Survey responses were as follows:

- Deer, elk, moose, and other ungulates (61%)
- Native fish and aquatic species (57%)
- Endangered, threatened, or rare species (grizzly bears, Canada lynx, etc.) (35%)
- Migratory birds (34%)
- Raptor nesting areas (33%)
- Bears (19%)
- Medium sized mammals (coyotes, foxes, etc.) (15%)
- Rodents (chipmunks, squirrels, voles, etc.) (5%)

Deer, Elk, Moose, and Other Ungulates

Protecting this wildlife is more important to residents of Belgrade, Manhattan, and Three Forks than City of Bozeman residents (74% vs. 55%).

Endangered, Threatened, Or Rare Species (Grizzly Bears, Canada Lynx, etc.)

Protecting these species are more important to residents of Bozeman than people in other areas (47% Bozeman, 23% Belgrade, Manhattan, Three Forks, 26% unincorporated).

Vegetation

Responses regarding vegetation were as follows:

- Water quality (64%)
- Food sources for wildlife (46%)
- Shelter for wildlife (32%)
- Pollination (32%)
- Native plant communities (31%)
- Forested areas (30%)
- Grasslands (23%)
- Tree canopy to prevent heat island effect (14%)
- Specimen trees (i.e., large cottonwoods, isolated stands of pine, unique species, etc.) (14%)
- Endangered, threatened, or rare species (Ute ladies-tresses, etc.) (10%)

Connectivity

Residents are concerned with increasing winter range throughout the southern Bozeman Valley and western Bridger Front, protecting the connectivity between wildlife habitats, and maintaining movement and migration corridors throughout the Valley. Connectivity goes beyond the study area to include the full extent of the Missouri River Basin and the Greater Yellowstone Ecosystem. Wildlife moves along the river corridors and between winter ranges of the Madison and Gallatin fronts.

Gallatin Valley residents' responses were as follows:

- Connectivity areas between wildlife habitat (46%)
- Resiliency to natural disasters and changing climate (ex. Wetland areas can mitigate the impacts of flooding) (38%)

Increase Climate Resilience To Natural Disasters

City of Bozeman residents cited this almost three times more than residents of Belgrade, Manhattan, and Three Forks (33% vs. 13%).

Mountain Brome grows in Gallatin Valley

Agricultural Heritage

Regarding working farms and ranches, people are most concerned about local food production, conserving native plants and wildlife habitat, and supporting local livestock production. There is also a desire to avoid sprawl into agricultural and natural areas, maintain a balance between growth and preservation, and concerns about the availability of water. Maintaining agricultural heritage also includes the visual identity of the rural community.

Maintaining contiguous areas for agricultural use was identified as another priority since adjacency to other working farms increases a farm's success. A wide variety of farm sizes are also necessary, as large farms produce commodity crops and small parcels focus on local produce. Irrigation infrastructure is critical to the longevity of the farming community. Unfortunately, certain areas in the Gallatin Valley, like the Triangle area, are becoming increasingly difficult to maintain as working agricultural lands. Climate will impact agricultural lands as growing seasons and timing of precipitation shift.

Gallatin Valley residents noted the following concerns as priorities in protecting working farms and ranches:

- Supporting local food production (71%)
- Conserving native plants and wildlife habitat - grasslands, wetlands, riparian areas (50%)
- Supporting local livestock production (49%)
- Supporting crop production for regional and natural needs (45%)
- Preserving agricultural heritage and sense of place (44%)
- Facilitating natural carbon sequestration (23%)

Provide Water Availability For Agricultural Users

Residents of Belgrade, Manhattan, and Three Forks noted this more than twice as much as City of Bozeman residents (51% vs. 24%).

Preserve Agricultural Heritage

People in unincorporated areas reported this twice as much as City of Bozeman residents (33% vs. 16%).

Water Quality and Quantity

When asked to note what is most important when protecting wetlands, riparian areas, lakes, streams, and rivers in the Gallatin Valley, results were as follows.

- Access to clean drinking water (67%)
- Wildlife habitat diversity (49%)
- Native fish populations (38%)
- Access to water for farm and ranch irrigation (38%)
- Aquatic species biodiversity (31%)
- Recreation opportunities (e.g., Fishing, rafting, swimming, etc.) (20%)
- Food for wildlife (15%)

Respondents' biggest concern is access to clean drinking water. Second is protecting diversity of wildlife habitat. Tied for third are native fish populations, access to water for farm and ranch irrigation, and resiliency to natural disasters and changing climate. Riparian corridors provide numerous benefits to wildlife and connectivity, such as for drinking water, shelter, and calving/nesting grounds. Irrigation ditches can help support groundwater recharge. The Study Area lies almost entirely within the Lower Gallatin Watershed, where water supply is primarily snowpack driven, and limited by an average annual precipitation of 16 inches.

Water quality and access to clean drinking water are of utmost concern to Gallatin Valley residents.

Indigenous Connections to the Landscape

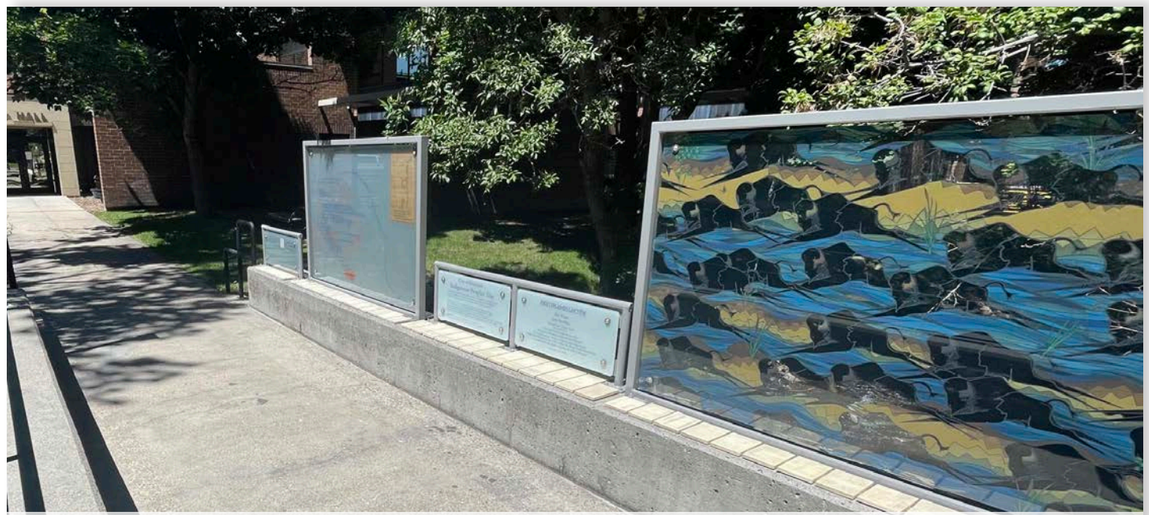
Indigenous presence in the Gallatin Valley is characterized by a rich archaeological record, oral traditions, Indigenous place names, and current contributions of Indigenous artists, community members, and scholars including through MSU's Department of Native American Studies. Indigenous connections to the landscape underlie all of the values listed above.

Archaeological sites in the Gallatin Valley include buffalo hunting sites, such as the Madison and Antonsen Buffalo Jumps, tipi rings, rock imagery, stone quarries, and a wide variety of other archaeological remains. The Gallatin Valley, or the "Valley Where The Rivers Mix" in the Apsáalooke language, has been and continues to be a nexus and gathering place for Tribal peoples from all four directions, including across the Continental Divide. Over two dozen Tribal Nations know this place as part of their homeland and have ancient names for the rivers and mountains, plants, and animals. The Wolf Mountains (Bridger), the Chokecherry River (Gallatin), Straight River (Madison), and Crooked River (Jefferson) are a few of the Apsáalooke names connected to the area. These three rivers flow into the Ogima-ikwe Ziibi (Head Woman River) which is the Anishinaabe name for the Missouri River.

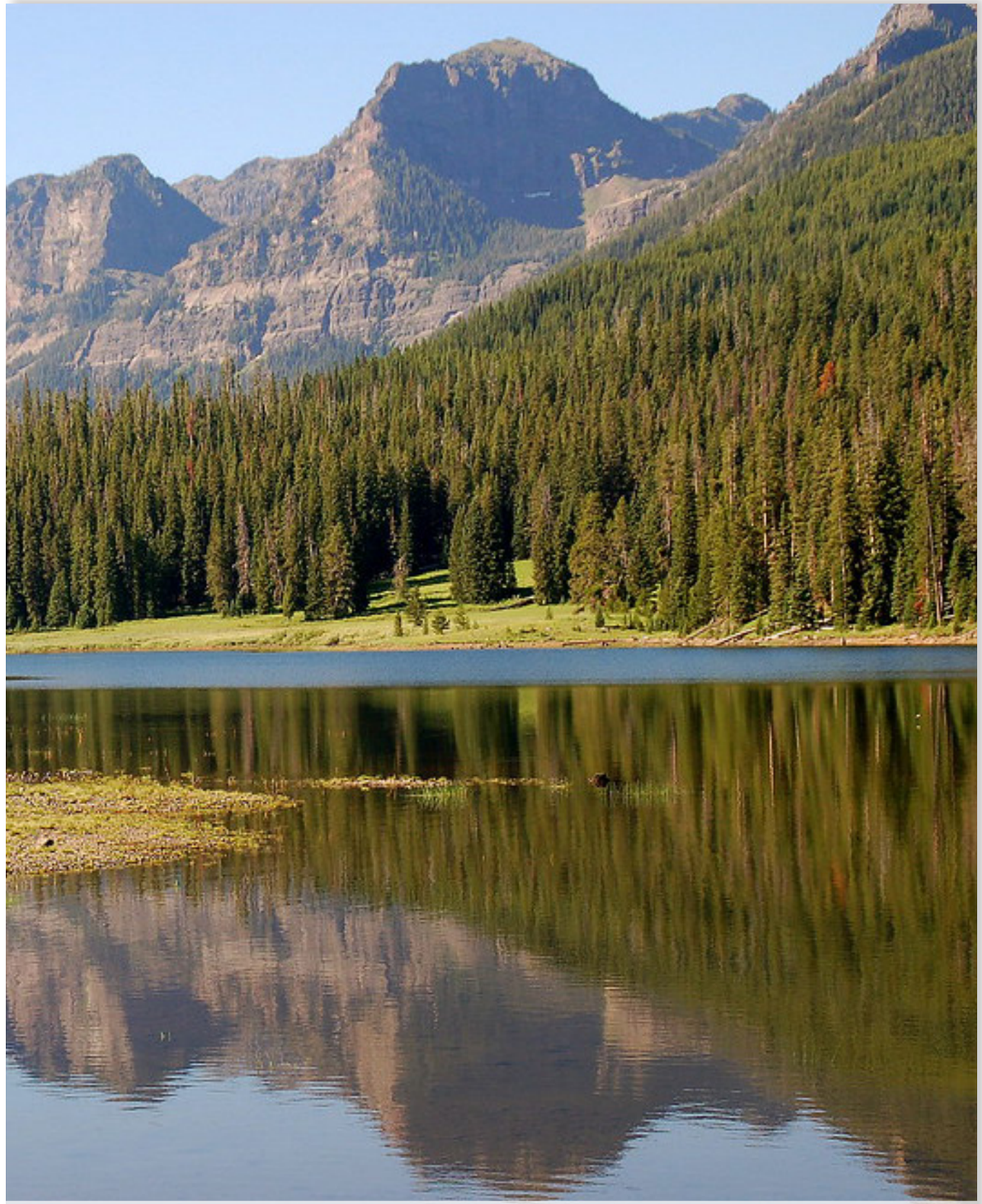
The Gallatin Valley, or the "Valley Where The Rivers Mix" has been and continues to be a nexus and gathering place for Tribal peoples from all four directions, including across the Continental Divide.

Many tribes came to this area seasonally because of its rich biodiversity, plentiful plant and berry gathering areas, hunting grounds, and stone quarries for making tools. Reciprocal relationships connect Indigenous people and the plant, animal, and water relatives that provide them with food, medicine, and ceremony.

A healthy and plentiful water supply supports the rich biodiversity found in the mountains, grasslands, and riparian areas of the Gallatin Valley. Indigenous connection to water is strong, historically indicated by campsites along streams and rivers, and by place names for rivers, streams, and other geographic features. This reverence continues to be expressed through the Revitalize Relatives artwork installed over Bozeman Creek at City Hall on Earth Day, 2023. This piece highlights the importance of Bozeman Creek to our daily life and ecosystem and speaks to important work that water does as a source and indicator of the health and vitality of the many plant, animal, and human communities in the Gallatin Valley.



***Revitalize Relatives* art installation over Bozeman Creek in front of City Hall, 2023.**



Hyalite Reservoir

Chapter 3:

Our Sensitive Lands

Sensitive Lands Themes

The Gallatin Valley sensitive lands models identify areas with resources that are disproportionately susceptible to impacts from development and degradation. The Working Group and project partners informed and guided the GIS modeling and engaged the public through a collaborative process. The iterative feedback identified which resources are valued the most and integrated into the models.

Resources that contribute to the sensitivity of lands were categorized into four themes and a model was developed for each.

While the resources in these four themes overlap and influence each other as a part of a greater Gallatin Valley ecological system, each theme can be viewed individually and in relation to each other to assess those particular resource priorities. Areas that are identified as sensitive for multiple themes are even more critical to address.

Wildlife and Biodiversity:

Preserve habitat and promote biodiversity

Connectivity:

Reduce habitat fragmentation

Agricultural Heritage:

Maintain the historic presence of agriculture

Water Quality and Quantity:

Ensure present and future access to water

Existing Sensitive Lands Models Overview

As part of the planning process, extensive research on different national and local models was completed to identify best practices in sensitive lands modeling efforts, as well as data to incorporate into this effort. Data that was used in this effort is identified in the pages after the model overview. .

National Models

Many regional, state, and national organizations collect data on rare and sensitive species, their natural habitat, or their threats. Natural resource models attempt to identify lands that best support the long-term survival of a suite of targeted species and natural communities. This section identifies existing models that address current growth management and resource conservation decisions that relate to natural resource, economic, agricultural, wildlife, and cultural factors. They tend to cover a larger spatial scale, which informs general observations of sensitive land trends and inputs.

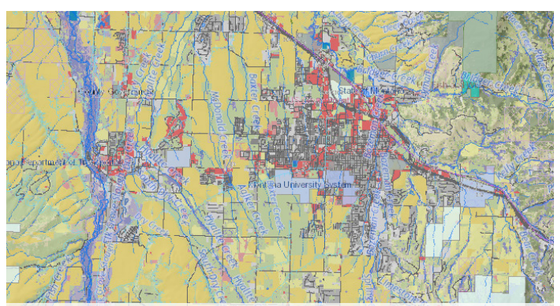
The publicly-available models shown in this section:

- Cover the Gallatin Valley Study Area;
- Are based on desktop scientific references and need ground-truthing;
- Do not account for land ownership and political boundaries;
- Are Informative for land-use planning and conservation strategies; and
- Do not have legal meaning or in any way represent an attempt to regulate or limit the use of private property.

Natural Heritage Map Viewer

Montana Natural Heritage Program

This viewer allows users to select from one of the following tasks: Generalized Species Observations, Land Cover, Land Management, Wetland, Riparian Mapping, and Photos. While this isn't a model, it's a great resource that displays state-wide management and environmental data and provides the option to summarize self-selected study areas. Users draw a study area to acquire breakdowns of land ownership, land use, wetland coverage, species, important plant and bird areas, and more. Learn more at https://mtnhp.org/

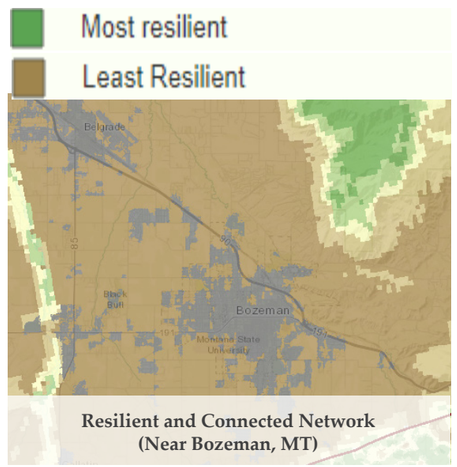


Land Management Summary of Gallatin Valley

TNC Resilient Lands Mapping Tool

The Nature Conservancy

This model identifies climate-resilient places and the movement paths between them by using biodiversity value (rare species, intact habitat, or exemplary natural communities) and site resilience (the ability of a site to support biological diversity and ecological functions even as it changes in response to climate change) to map climate-resilient places. Learn more at https://maps.tnc.org/resilientland/



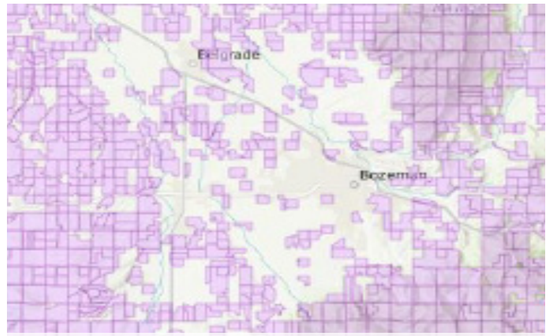
Resilient and Connected Network (Near Bozeman, MT)

Source: Anderson, et.al; 2016. Resilient and Connected Landscapes for Terrestrial Conservation. The Nature Conservancy, Eastern Conservation Science, Eastern Regional Office. Boston, MA..

Conservation Carbon Map

Trust for Public Land

This model focuses on conservation to maximize climate benefits. Specifically, this tool looks at threats to carbon-rich landscapes from development, insects, disease, and wildfire risk. This tool summarizes forest carbon storage, sequestration rates, development risk, insect and disease risk, wildfire hazard potential, rare ecosystems, and intact habitat cores at the state, county, and watershed scale. Parcel-level attributes are presented for carbon, threats, and co-benefits. https://web.tplgis.org/carbonmap/

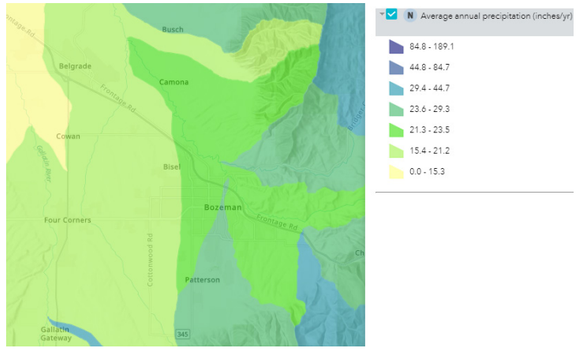


Breakdown of Bozeman Parcels

EPA EnviroAtlas

Environmental Protection Agency

This model seeks to effectively measure and communicate the type, quality, and extent of goods and services that humans receive from ecosystems so that their true value can be considered in decision-making. EnviroAtlas houses and combines an extensive collection of spatial data, including modeled results, field research, and results of literature reviews from a variety of government and non-government sources. This information characterizes the benefits derived from the natural environment, community infrastructure, demographics, and health outcomes. This model is a holistic resource that contains economic, environmental, and social models that can be overlaid to create comparisons across factors. Examples of models include ecosystem markets, engagement with outdoors, health and economic outcomes, water supply, runoff, and flow, and more. https://enviroatlas.epa.gov/enviroatlas/interactivemap/

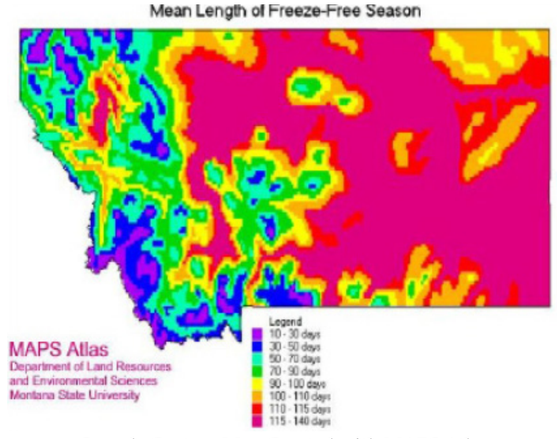


Annual Participation (Near Bozeman, MT)

Montana Agricultural Potentials System (MAPS Atlas)

Montana State University

This model is designed to improve decisions made by people who manage land resources. The model divides Montana into about 18,000 cells, each representing slightly more than three miles north and south by two miles east and west. The model combines the following environmental attributes: precipitation, growing season, temperature, land use, soils, and physiography. MAPS Atlas is best used for combining general attributes for environmental assessment and site selection. https://www.montana.edu/places/maps/



Sample Custom Map Created with MAPS Atlas

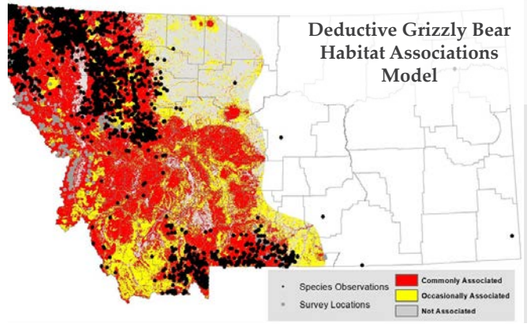
Local Models

Before developing a new model, it is essential to understand how existing models evaluate specific factors at a localized scale. The inputs and outputs of existing models were evaluated to determine if they could be incorporated into the sensitive lands model to avoid a redundancy in efforts. Four sample models are outlined in this summary to inform successful modeling practices and identify gaps in environmental, economic, agricultural, wildlife, and cultural data. Review of these existing models helped inform design, development and implementation of the sensitive lands model.

Habitat Suitability Biodiversity Model

Montana Natural Heritage Program

The Montana Natural Heritage Program (MNHP) uses inductive and deductive models to predict habitat suitability and ecological system association with individual species. The inductive model predicts current distribution and relative suitability of general year-round habitat. The model uses observation data for an individual species combined with 44 statewide biotic and abiotic environmental layers. Deductive modeling represents how ecological systems are commonly or occasionally associated with a specific species year-round from statewide land cover classifications, species observations, and characteristics of used habitat documented in literature.

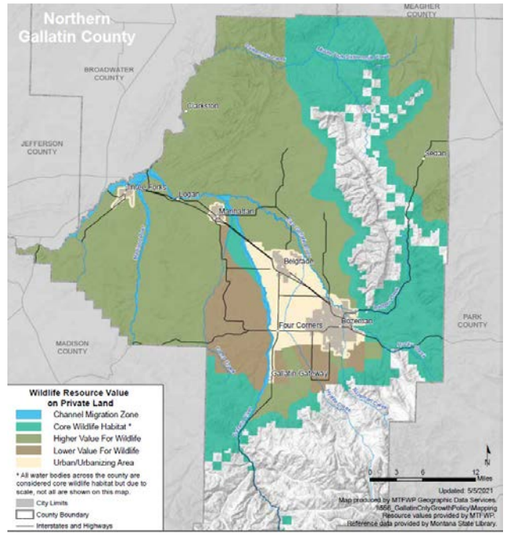


Species are classified as commonly associated, occasionally associated, or not associated with each ecological system based on the degree to which structural characteristics of an ecological system match the preferred structural habitat for each species outlined in literature. The output is a spatial dataset of categorical habitat suitability based on ecological system associations within the species presumed range. MNHP provides Habitat Suitability and Biodiversity for statewide species. This database is an input representing wildlife factors in the sensitive lands model. https://mtnhp.org/models/

Wildlife Resource Value on Private Land

Montana Fish, Wildlife, and Parks (MFWP)

MFWP's Resource Value on Private Land model is an example of a lower level model that identifies core wildlife habitat and prioritizes value for wildlife based on an overlay of layers. For example, "High Value for Wildlife" encompasses riparian areas, wetlands, cottonwood galleries, and native habitat based on land cover. While "Lower Value for Wildlife" uses landcover, cadastral, and structure data to outline subdivisions and agricultural land to represent land use with poor habitat quality and corridor connectivity. In addition, the model utilizes species of concern habitat to highlight a core wildlife habitat classification. This data was compiled for the recently adopted Gallatin County Growth Policy (2021). Learn more at: https://gallatincomtvirtualtownhall.net/planning-community-development/pages/plans-policies.



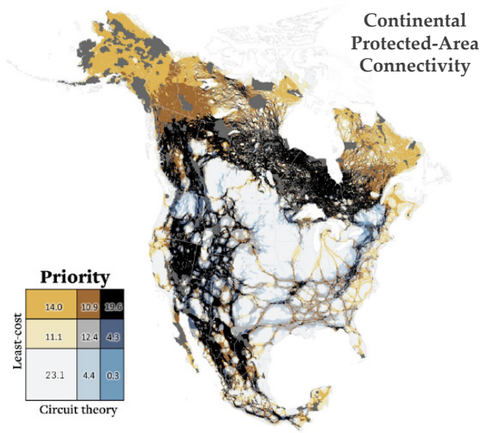
Wildlife Resource Value on Private Land

Modeling an Aspirational Connected Network of Protected Areas

The Wilderness Society

This is a multi-scale connectivity model that utilizes least-cost and circuit theory to prioritize corridors with the least human-modified lands between large protected areas of North America. Least cost theory assumes organisms have perfect information of their landscape resistance to movement, and therefore traverse "optimal" routes that minimize the distance between a source and the destination. The model first maps least modified corridors that link protected areas in the network using least cost and circuit theory approaches. A resistance surface layer is used to represent human-modified land that essentially dissolves out land that doesn't contribute to corridor connectivity (development, agriculture, transportation corridors, dams, etc.). A set of linkages is then mapped that connect all protected areas while minimizing total network resistance. Next, a betweenness centrality metric was used to prioritize individual linkages within each corridor. Regional networks of protected lands were then identified with their mapped priority linkages.

Ridgelines offer important connectivity at high latitudes, and valley bottoms offer important connectivity at all latitudes. https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/eap.2387

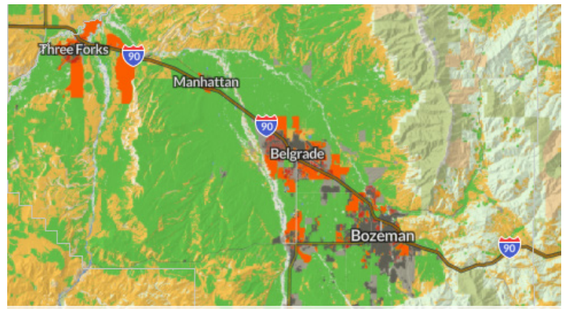


Source: Kevin Barnett and R. Travis Belote, The Wilderness Society

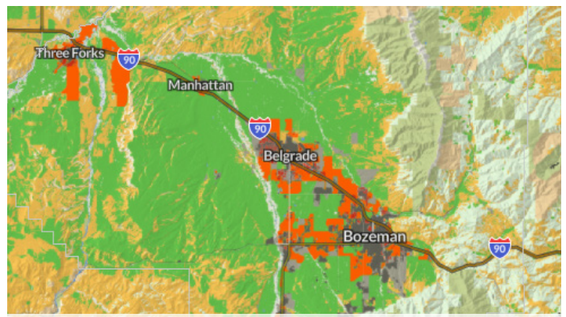
Farms Under Threat 2040: Choosing an Abundant Future

American Farmland Trust

Farms under Threat 2040 models the conversion rate of farmland to development through three scenarios: Business as usual (historical conservation rate from 2001-2016 conversion rate), runaway sprawl (50% higher than business as usual), and better built sites (50% lower than business as usual). The outputs of this model are three scenario projections from 2016-2040 representing the amount of acres lost to urban/highly developed and low-density residential land uses.



Farms Under Threat 2040: Business as Usual Projection



Farms Under Threat 2040: Runaway Sprawl

Model Process

1. Select Resources to Represent Themes
2. Determine Quality, Authoritative Data Sources for Resources
3. Assign Sensitivity Scoring
4. Map Sensitivity

Input Selection and Data Sources

No new field data was collected or created for this study. Instead, the study relied on best available existing resource data produced by authoritative sources. After values were identified by the public, the team gathered data from authoritative sources. Some authoritative sources were identified by Working Group members who are experts in relevant fields or by project partners, while others were identified as being gold standards in the environmental field. For example, the U.S. Geological Survey National Hydrology Dataset (NHD) Flowline was used as the source for ditches, streams, and rivers for all counties except for Gallatin County, since the NHD is a well respected standard for surface water data. However, a more accurate local dataset for surface water was suggested by Working Group members familiar with data throughout the Gallatin Valley.

Other authoritative sources for this study include federal, state, and local governmental entities such as the Federal Emergency Management Agency, Montana Natural Heritage Program (MNHP), Montana Fish, Wildlife, and Parks (MFWP), Montana State Library, and Gallatin County. Peer reviewed research and research from non-government organizations were also integrated into the model, including sources like academic institutions, The Nature Conservancy, and the Center for Large Landscape Conservation.

WHAT IS AN AUTHORITATIVE DATA SOURCE?

A data source that is considered to be the most reliable or gold standard data source because it is the primary repository of valid and trusted data.

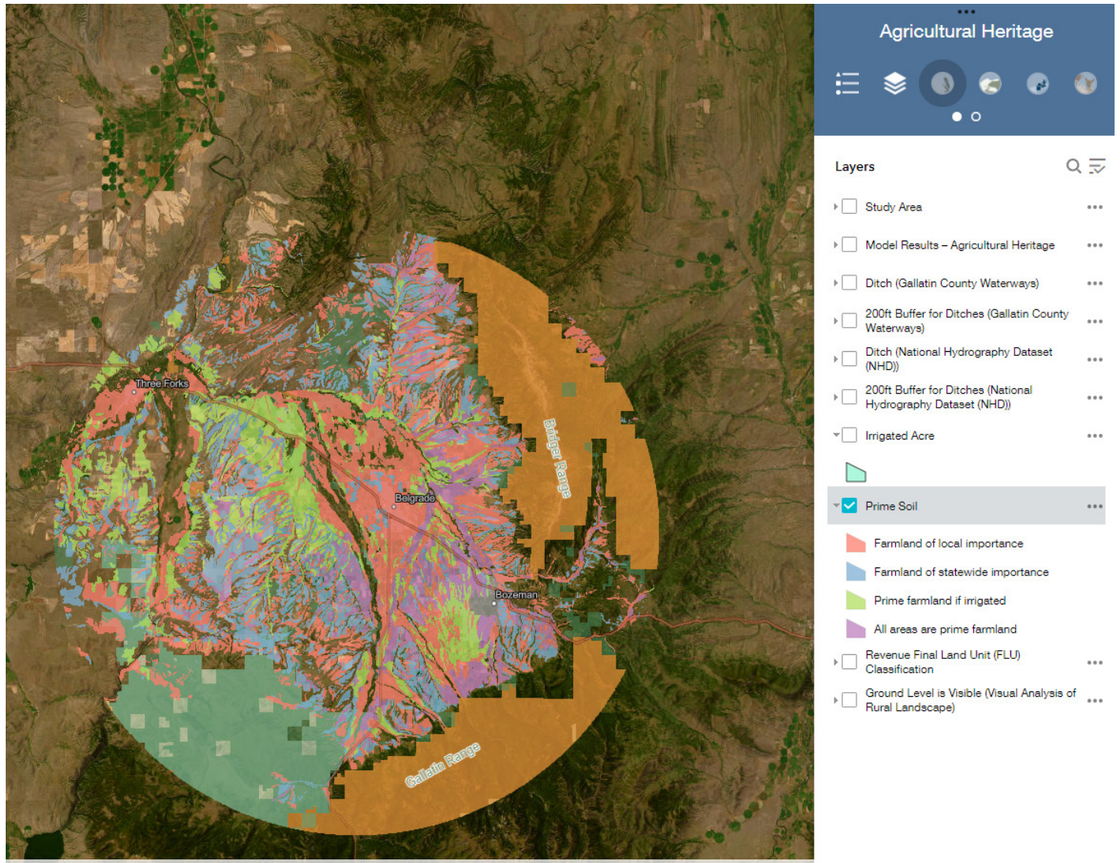
Data resources considered were selected and refined through consultation with experts from the Working Group. The GIS team determined data suitability based on availability, accuracy, completeness, scale, and coverage of the study area. Appendix C lists inputs for each theme model and includes data sources, file types, publication year, coverage, brief descriptions of the data, and links to download the data when publicly available. Data that were investigated as a potential model inputs but were ultimately excluded are listed in Appendix C with brief explanations for their exclusion.

Model Design

After data was collected for the four themes, relevant information were selected for each input layer according to Working Group input. The selected attributes and features were then given a score from 0 to 3 based on how sensitive the resource theme may be to impacts, with 0 being the least sensitive and 3 being the most sensitive.

For example, for prime soils in the Agricultural Heritage theme, areas designated as prime farmland are given a 3, areas with farmland designated as being of statewide or local importance are given a 2, areas designated as prime farmland if irrigated are given a 1, and areas designated as not farmland are given a 0. Selections for each input by theme and the sensitivity scores assigned to each selection can be found in Appendix C.

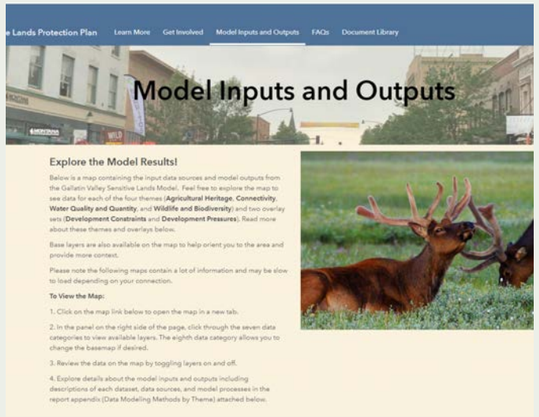
After individual scoring, sensitivity scores for individual inputs were summed for an overall theme sensitivity score. Total theme sensitivity score are mapped on the following pages. More details on model design and data processing can be found in Appendix C.

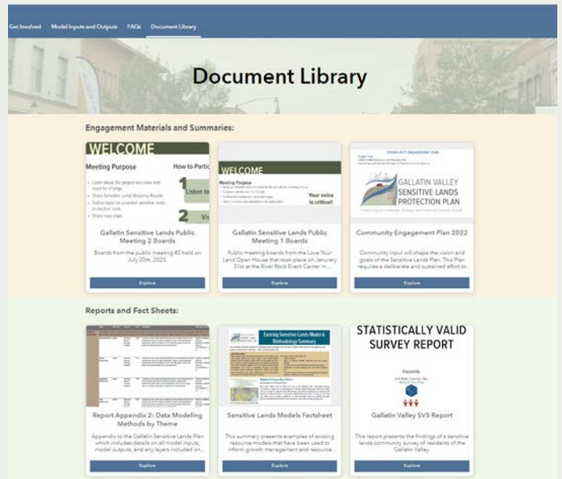


Prime Soils and Associated Scoring Example

EXPLORE THE DATA – ARCGIS ONLINE HUB

Interactive maps are also available as a living document on the project website. The website connects the public and Working Group collaborators to the modeling data and allows them to stay updated on the project timeline and developments, learn about project details and meeting information, and provide feedback throughout the project lifetime. Users can view inputs and outputs for each theme and view how individual scoring of each input adds up to the theme's overall sensitivity scores.





Data and Model Limitations

Since the sensitive lands models rely on external data, each dataset is not consistent in accuracy, scale, and data standards. Differing data standards were controlled by including data from authoritative and reputable sources, which are assumed to follow their respective data standards. The most accurate data available locally was prioritized when multiple data sources were available for the same resource. The scale of data inputs also varied, impacting the level at which results are meaningful. This study is intended to be interpreted at a regional scale rather than at a parcel level. Uncertainties and inaccuracies may exist in input datasets.

Although resiliency and adaptation planning for climate change are considerations in the overall protection plan, the climate resilient watershed layer is the only resource input that includes climate considerations. Planners should consult other studies and research as they become available. See sources such as The Nature Conservancy's climate resilience datasets.

Wildlife and Biodiversity

What's the Data?

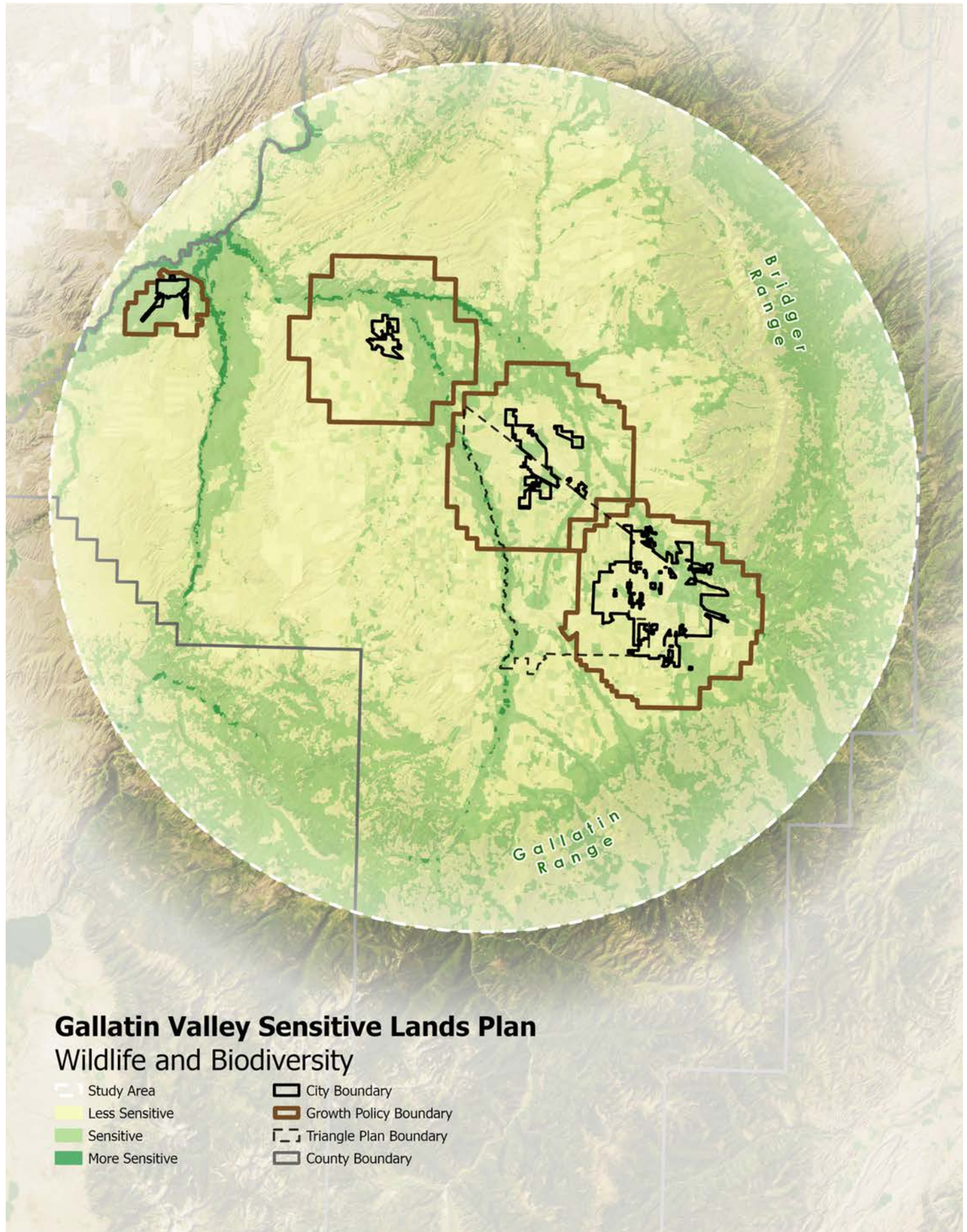
- Mammal Biodiversity
- Bird Biodiversity
- Reptile Biodiversity
- Amphibian Biodiversity
- Native Fish Biodiversity
- Plant Biodiversity

Takeaways

- Hotspots, shown in darker green, are located along waterways and along the Bridger Mountain Range extending into the Gallatin Mountain Range.
- Sensitive land is also concentrated around protected lands like conservation easements, national wildlife refuges, and other special designations (see Gallatin Sensitive Lands Hub for protected lands).
- Lands within and between the Bridger and Gallatin Mountain Ranges are high in biodiversity and also contain climate resilient watersheds. These areas are at high risk from wildfires.

Limitations

- Model inputs cannot be interpreted at scales smaller than their original 90 x 90-meter data cells.
- As noted by the MNHP, landcover may have changed and additional development may have occurred since model inputs were created, possibly skewing sensitivity scores lower, especially for species in transitional areas between different vegetation communities or in patchy ecological systems.
- Model results should be verified with on the ground surveys, policy verifications, and other additional studies to confirm sensitive lands.
- The MNHP also caution that "ecological systems associated with a species are only mapped within the range of that species, although portions of that ecological system may occur elsewhere."



View an interactive, zoomable version of this map at the project website's ArcGIS Hub.

Connectivity

What's the Data?

- Wetlands and Riparian Areas
- Conservation Easements, Managed Areas, and City of Bozeman Dedicated Parks and Open Space
- Directed and Undirected Model Pathways for Female Grizzly Bears
- Wildlife Resource Value on Private Lands

Generalized Connectivity Regions

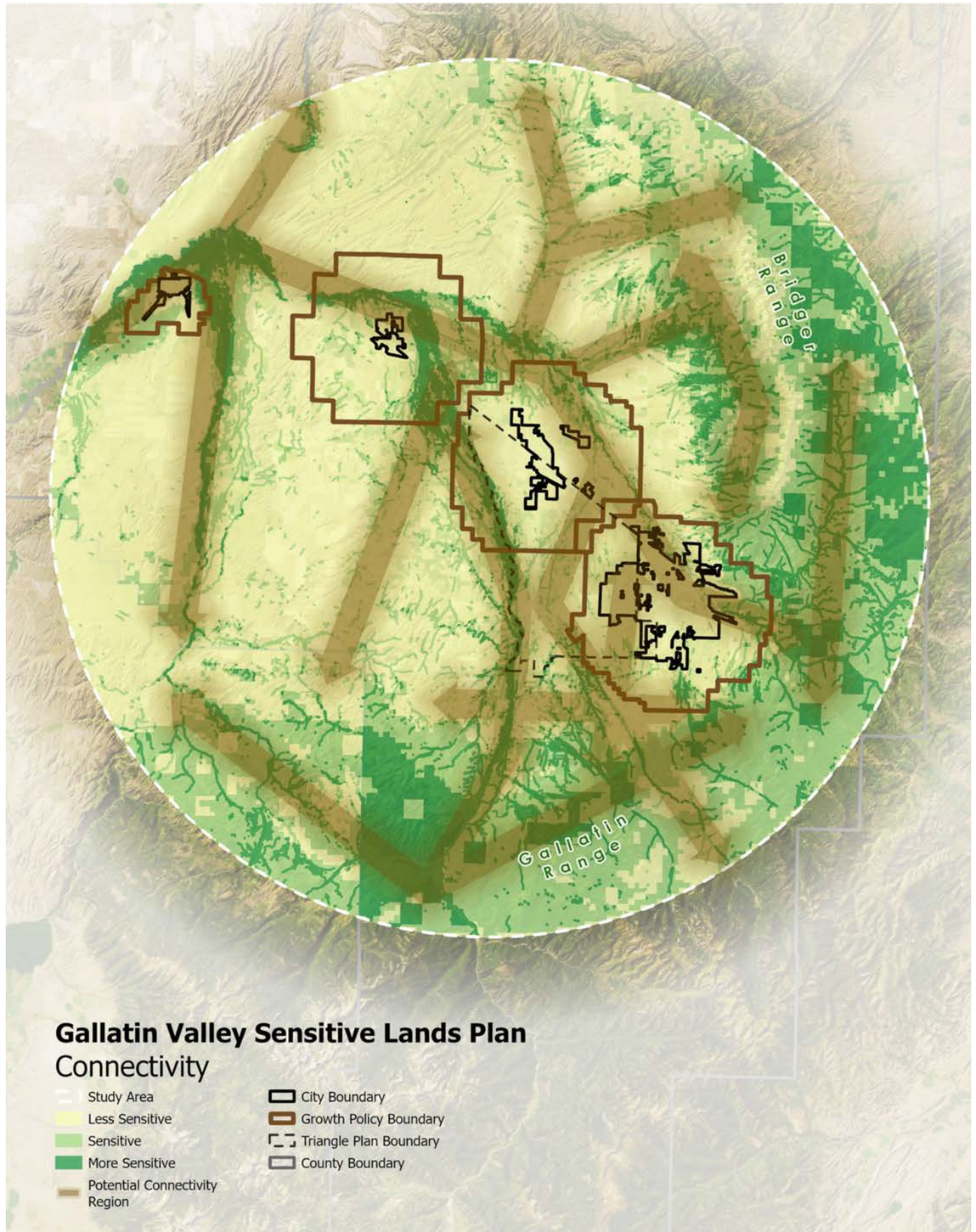
The Connectivity model does not represent actual corridors since telemetry and GPS tracking is confidential and not available for this study from FWP. Due to this data gap, arrows representing generalized corridors that could provide connections between potential wildlife hotspots are shown on the map. Corridors were selected by connecting hotspots from the Wildlife and Biodiversity results and through consultation with local field biologists.

Takeaways

- Public lands can play an important role in movement corridors and as refuge between lands with other development pressures.
- Generalized connectivity regions tend to follow water corridors and the Bridger and Gallatin Ranges.
- Darker Green areas represent more intact riparian and wetland areas, big game winter patches, and core habitats. Where protected from degradation and human disturbance and barriers, these serve as wildlife corridors. As development and human growth increases, wildlife corridors shift in response.

Limitations

- Data representing regional wildlife species corridors and their movements are not publicly available at a small enough scale to be meaningful for this analysis.
- Wildlife resource value data only covers private lands. Public lands, like some conservation easements and managed lands, are not included in this dataset and are therefore de-emphasized in the model results despite often also being important nodes for wildlife connectivity.



View an interactive, zoomable version of this map at the project website's ArcGIS Hub.

Agricultural Heritage

What's the Data?

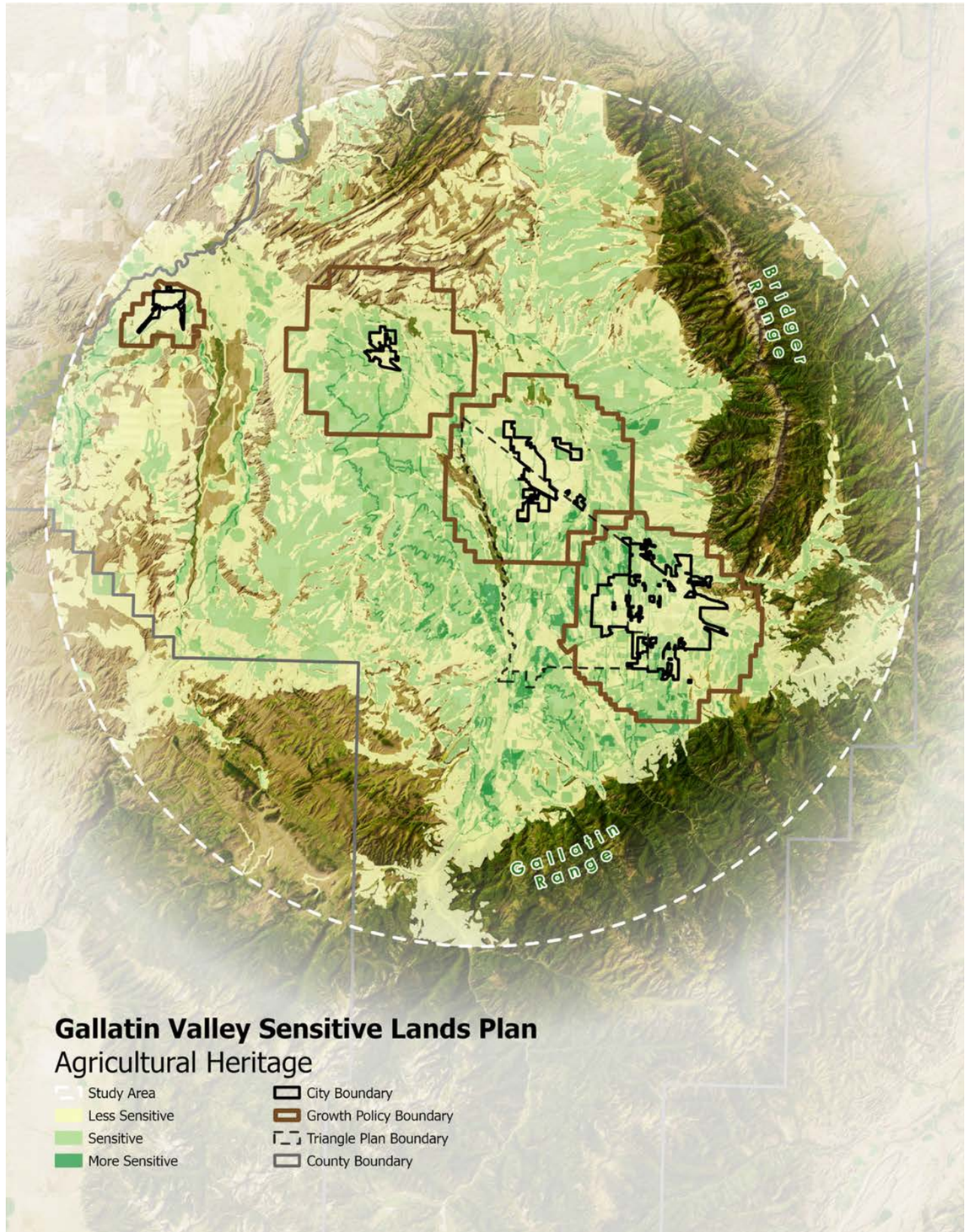
- Prime Farmland
- Irrigated and Non-Irrigated Farmland (Rangeland)
- Ditches
- Visual Analysis of the Rural Landscape

Takeaways

- Waterways (ditches) and natural perennial streams are shown as the most sensitive resources as darker green lines. Ditches are critical infrastructure that sustain agricultural operations and rely on perennial streams as their water source.
- The most productive farmlands are dispersed through the middle of the study area outside of current city limits.

Limitations

- The model does not account for grazing on private lands since the data from the Montana Department of Revenue representing agricultural lands does not directly track land used for grazing.
- Due to sensitivity of Indigenous knowledge, the model does not address specific cultural or tribal heritage other than agriculture.



View an interactive, zoomable version of this map at the project website's ArcGIS Hub.

Water Quality and Quantity

What's the Data?

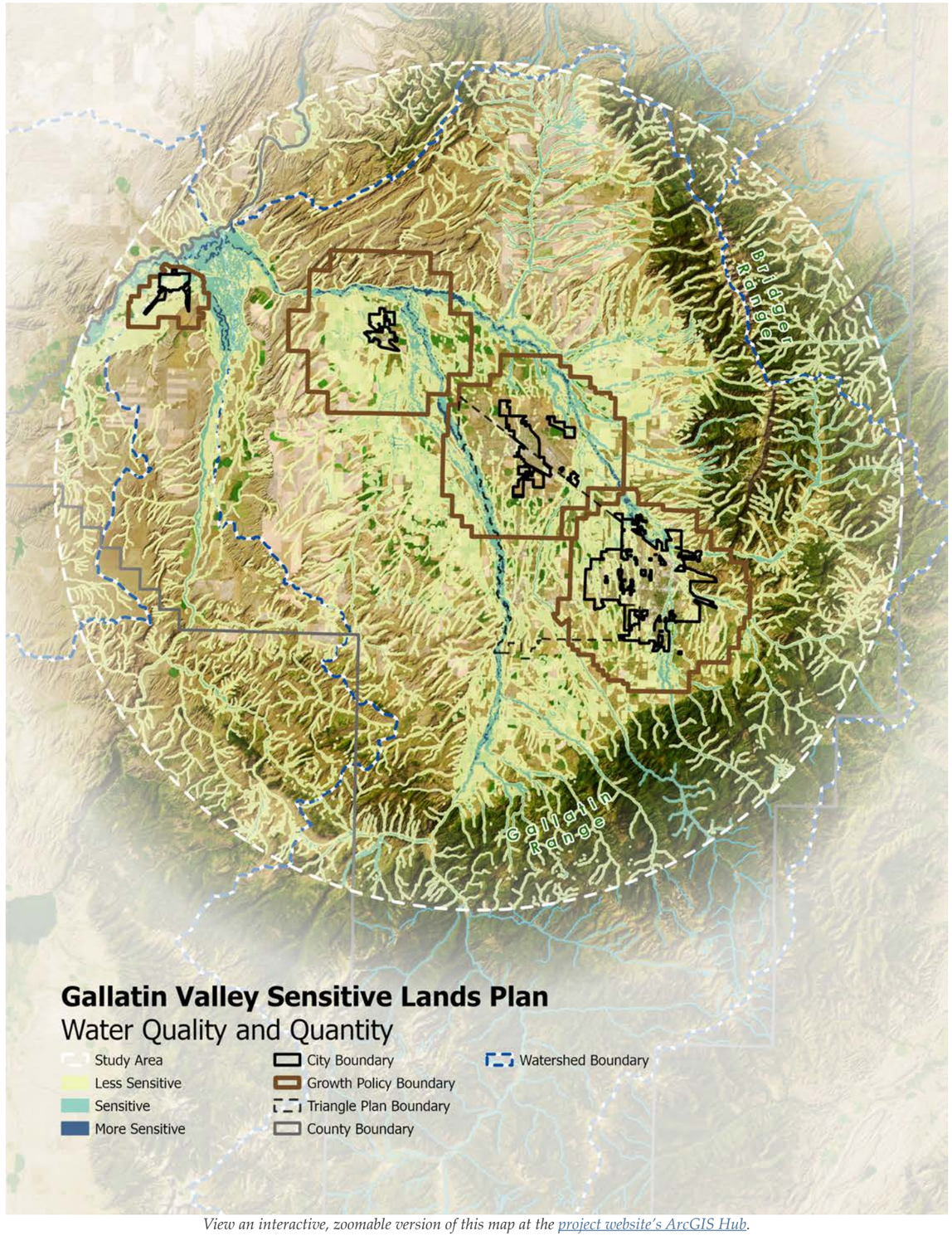
- Floodplain
- Streams and Rivers
- Wetlands and Riparian Areas
- Channel Migration Zones
- Areas Recommended for Water Recharge Suitability Investigation
- Buffered Water Features
- Climate Resilient Watersheds

Takeaways

- Hotspots are located along the Valley's major rivers: the Madison, East Gallatin, Gallatin, and Jefferson Rivers.
- Sensitive lands identified in the watersheds that originate in the Gallatin Range, in the southwest portion of the study area, are particularly important because these watersheds are more climate resilient and their protection is critical for sustaining flows in the East Gallatin and Gallatin Rivers.
- Water is an essential resource for sensitive lands across all themes. Protection along waterways, riparian areas, and wetlands is critical for a resilient future.

Limitations

- This theme does not include data that directly represents water quality and quantity. Water quality and quantity are accounted for by including mapped lands that provide natural water treatment and water storage such as wetlands, floodplains, and riparian areas.
- Water data is more complete and accurate for Gallatin County than for Madison and Broadwater Counties. Therefore this model does not account for data gaps - the model ranking is dependent on the existence of data, and some layers were not equally available across the study area, such as mapped floodplains and channel migration zones. See Appendix C for data coverage details.



View an interactive, zoomable version of this map at the project website's ArcGIS Hub.

Overlays

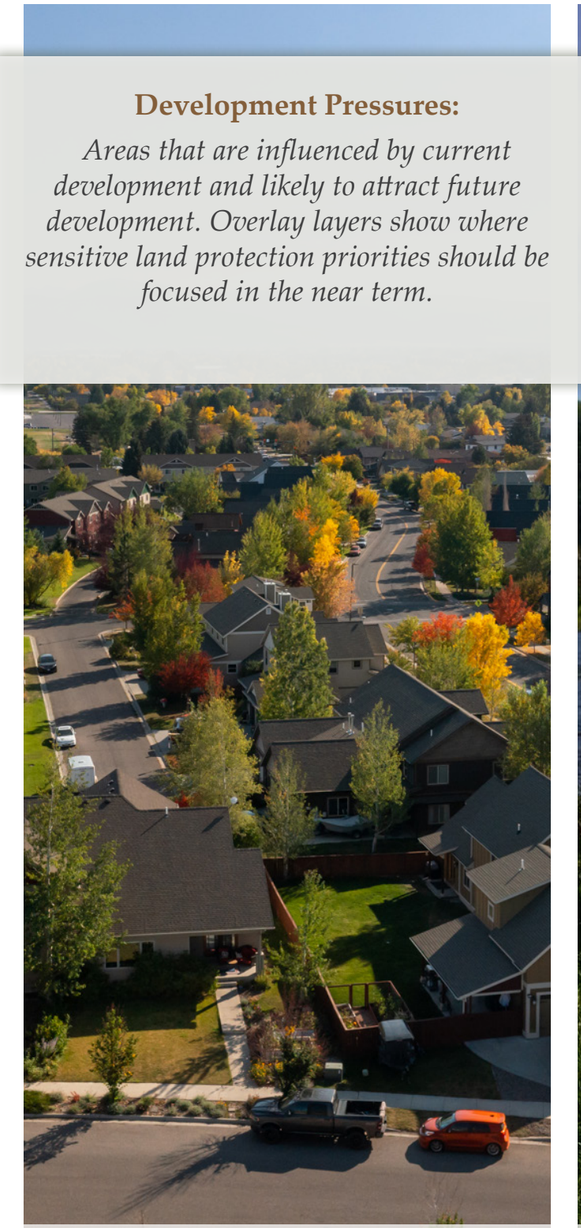
In addition to the sensitive lands models, this study also developed two types of overlay datasets. Overlays offer insights into priorities for sensitive lands protection. The overlays include:

Development Pressures:

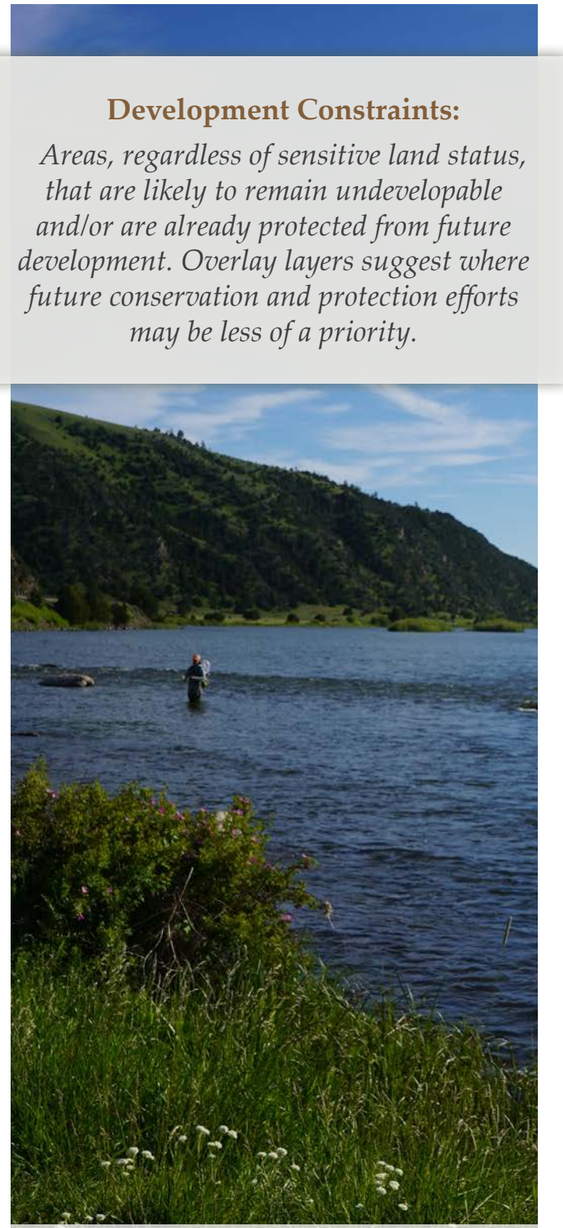
Areas that are influenced by current development and likely to attract future development. Overlay layers show where sensitive land protection priorities should be focused in the near term.

Development Constraints:

Areas, regardless of sensitive land status, that are likely to remain undevelopable and/or are already protected from future development. Overlay layers suggest where future conservation and protection efforts may be less of a priority.



Subdivision development



Protected landscape

Development Pressures

How can I use this overlay set?

Development Pressures layers are useful in indicating areas that are:

1. **At greater risk** for future development because they are experiencing higher levels of environmental disturbance due to human influence in the area. These are represented by **major and minor subdivisions** and a **human disturbance index**.
2. **Critical to protect** to ensure the health and safety of both humans and ecological systems within Gallatin Valley. These are represented by **wildfire prone areas** and **climate resilient watersheds**.

What are the Development Pressure overlays?

- Climate Resilient Watersheds
- Human Disturbance Index
- Wildfire Prone Areas
- Major and Minor Subdivisions

Takeaways

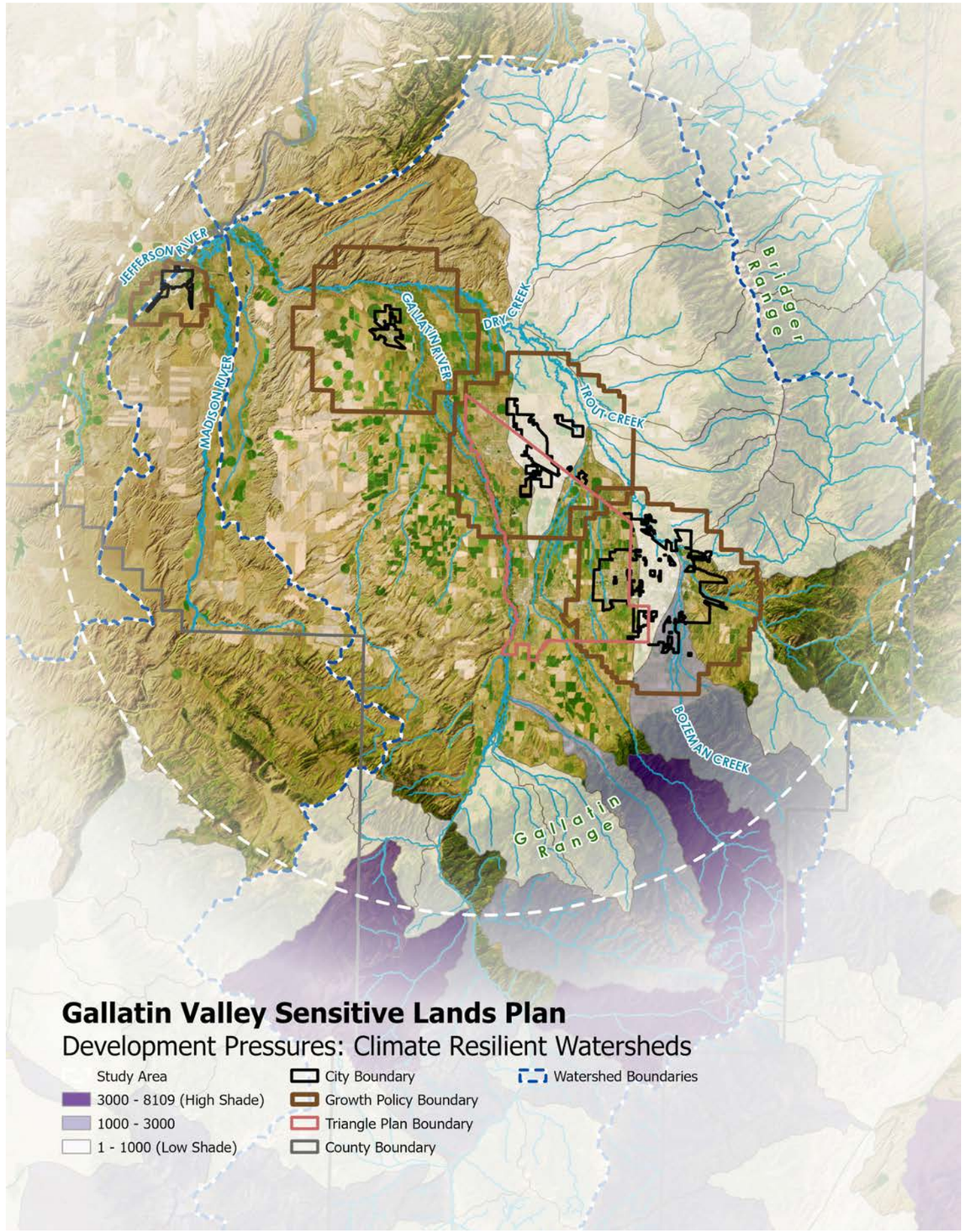
- Areas with the highest rating on the human disturbance index are concentrated around waterways, areas that also score high for sensitivity. Although protection to varying degrees is already in place for many of these areas, they are also more prone to human disturbance and are more sensitive to disturbances when they occur.
- Over 962 subdivisions covering over 37,000 acres have been approved outside of incorporated areas. This weakens the distinction between “town” and “country”, fragments wildlife habitat, increases congestion and commutes increasing air pollution, increases the costs of county services increasing taxes, and impacts groundwater quality and supply.
- The frequency, magnitude, and intensity of catastrophic wildfire is increasing. Wildfire risk is now “extreme” for the cities of Bozeman and Belgrade, in part due to the number of rural subdivisions built in the wildland-urban interface.
- Climate resilient watersheds, or watersheds with baseflows primarily controlled by snowpacks that persist year-to-year, are increasingly important because the existence of snowpack within these watersheds determines future water quality and quantity for Gallatin Valley as climate change progresses. The integrity of these watersheds is especially sensitive to impacts from wildfire.

Limitations

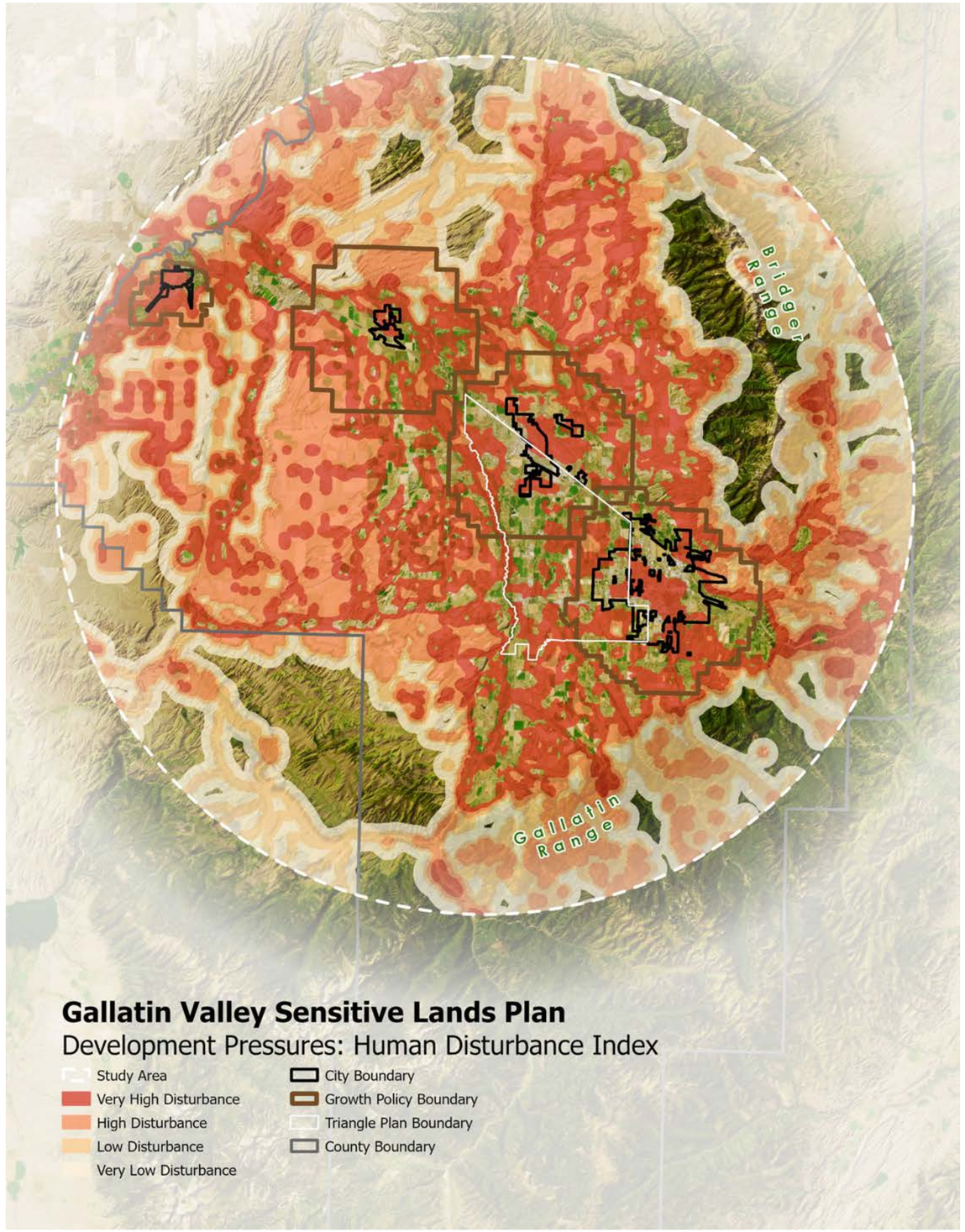
- The subdivision overlay only includes approved subdivisions. It does not show proposed subdivisions that may be at varying phase of permitting.
- The data in this overlay set are not exhaustive of all development pressures to sensitive lands such as water pollution, habitat fragmentation, light pollution, and other concerns.

Focusing development within existing city planning jurisdiction areas can reduce impacts to sensitive lands elsewhere. City planning jurisdictions, Bozeman’s Growth Policy Boundary, and the Triangle Plan Boundary provide the necessary infrastructure to support development in an efficient and cost-effective way. Developments within these areas should consider designs and neighborhood layouts that work with natural drainages, provide wildlife friendly passage, and support nature in the city. All these elements also provide human benefits such as efficient stormwater management, clean air and water, and access to passive recreational spaces.

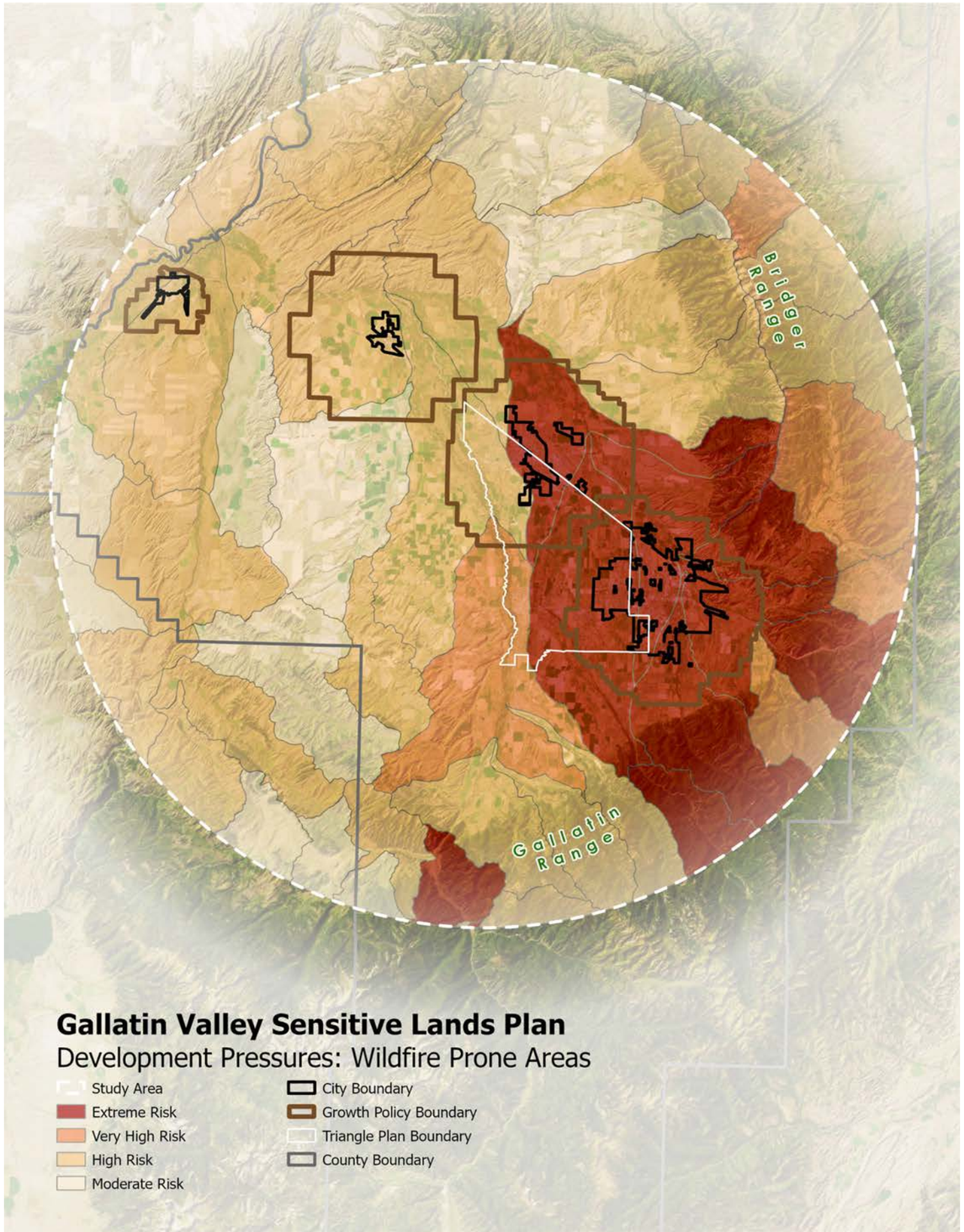
Development threatens impacts to sensitive lands



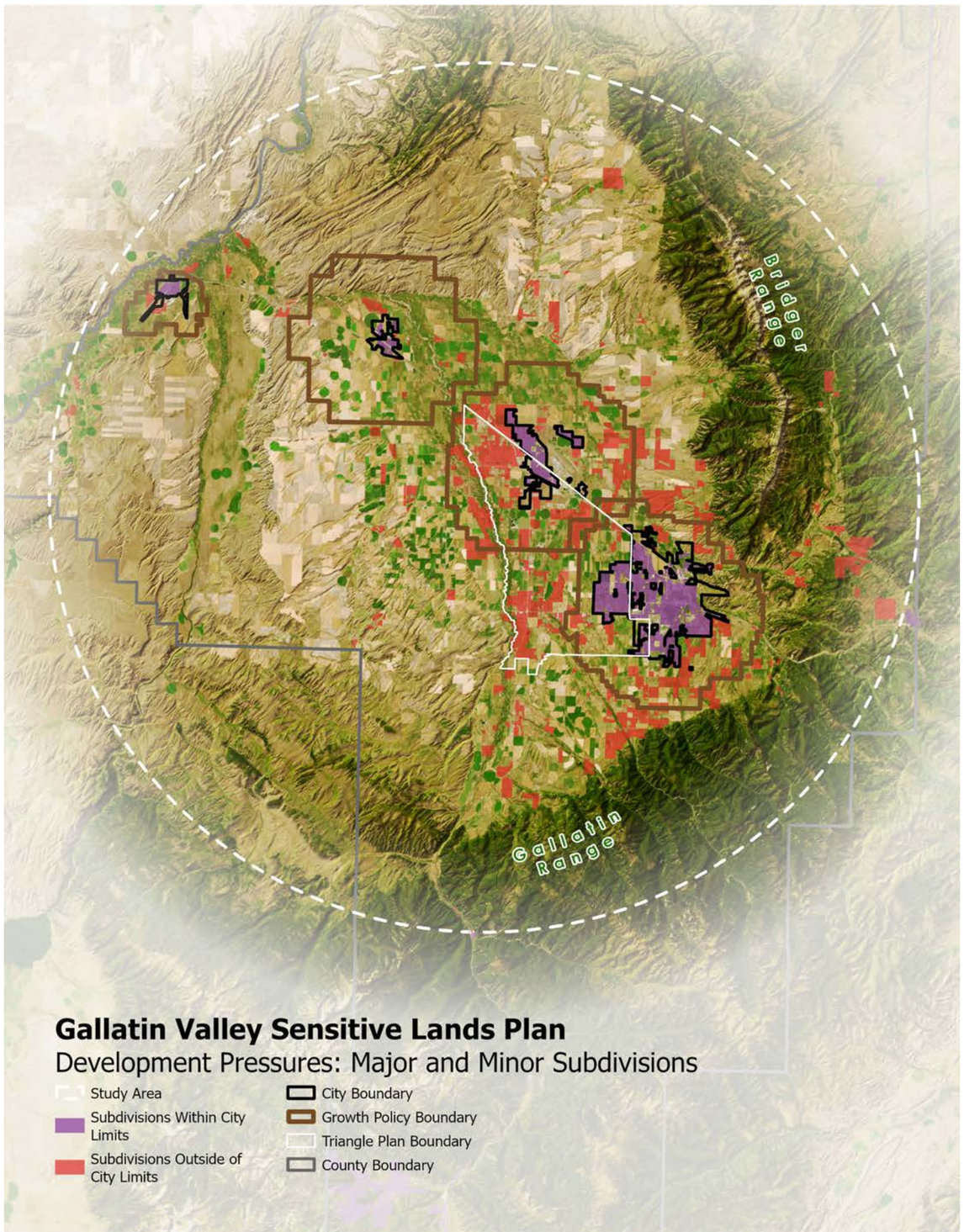
View an interactive, zoomable version of this map at the project website's ArcGIS Hub.



View an interactive, zoomable version of this map at the project website's ArcGIS Hub.



View an interactive, zoomable version of this map at the project website's ArcGIS Hub.



View an interactive, zoomable version of this map at the project website's ArcGIS Hub.

Development Constraints

How can I use this overlay set?

The Development Constraints overlay highlights areas that already experience some degree of protection from future development projects. These protections range from special land designations to the presence of physical features that are less desirable to land developers, thereby making the areas less feasible for development though not formally protected. For example, land within a floodplain or with a higher slope presents an increased challenge and investment risk to developers and in some cases development is more tightly controlled.

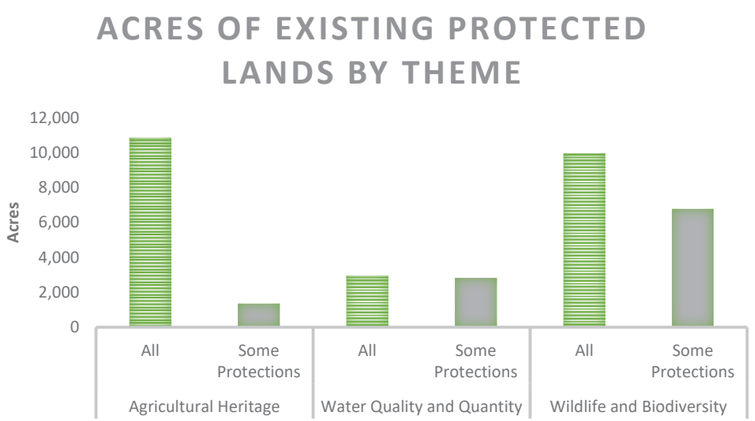
What is in the Development Constraints overlay?

- Slopes Over 25%
- Floodplain
- Conservation Easements, Managed Areas, and City of Bozeman Dedicated Parks and Open Space

Takeaways

The chart below shows the total acres of highly sensitive lands from three models: Wildlife and Biodiversity, Water Quality and Quantity, and Agricultural Heritage. High sensitive is defined as the highest third of the sensitivity score for each theme. Some of the same lands overlap and are significant for all three themes. "Some Protections" refers to overlapping development constraints on sensitive lands within the study area: conservation easements, lands with slopes over 25 percent, or other special designations such as floodplains or other federal protections. The extent of specific protections varies depending on the resource and environmental commitment. The Agricultural Heritage resource has the least amount of development constraints (12 percent), while Water Quality and Quantity have the most development constraints (95 percent).

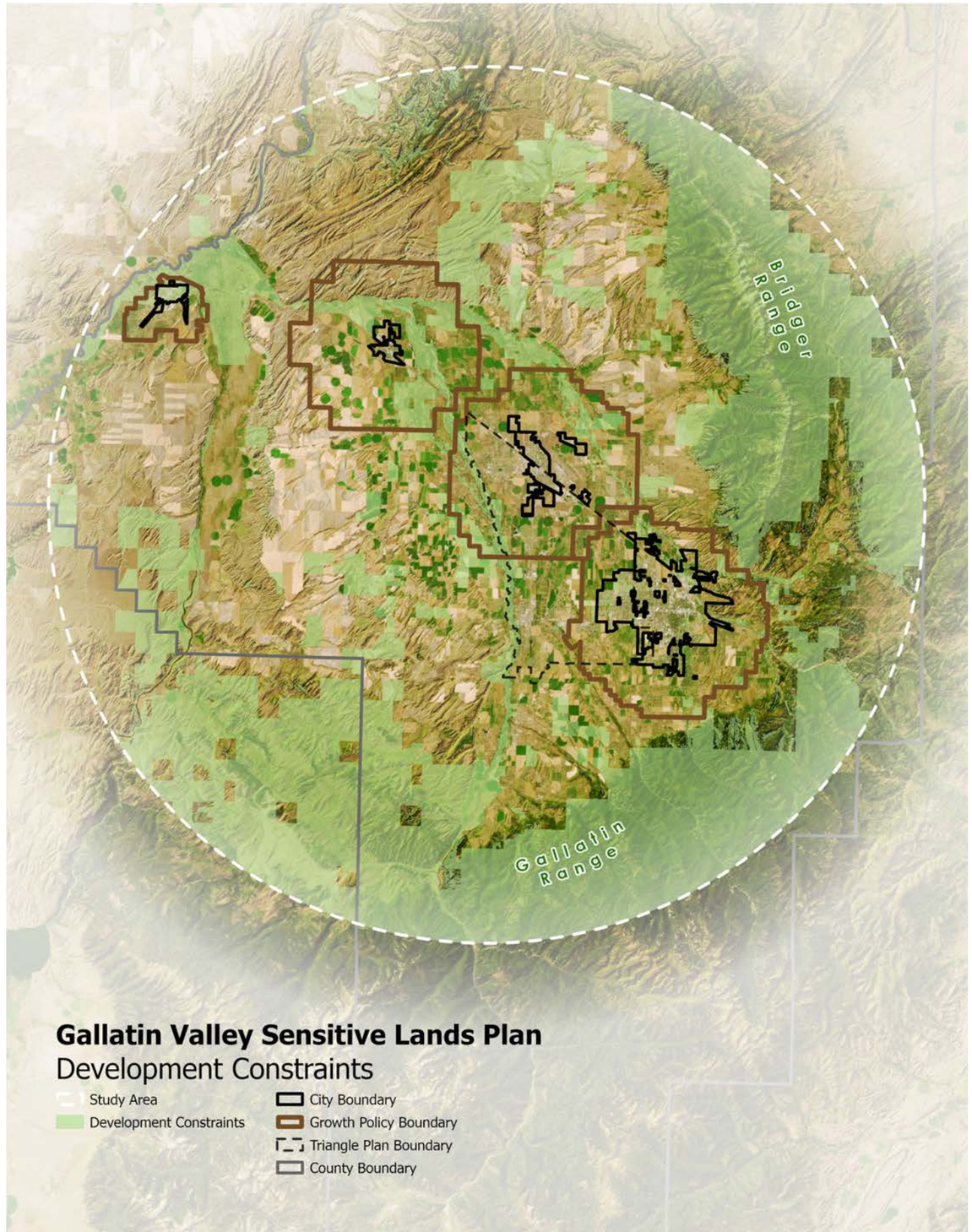
Also note that although a majority of the highly sensitive lands in the Water Quality and Quantity theme have some existing protections, there is more to ensuring the health of the waterways of the Valley than floodplain development restrictions. Much of the water for the entire Gallatin Valley is sourced in just a few critical watersheds in the Gallatin Mountains. The quantity and quality of upstream water directly impacts what flows downstream, making a system-wide view important for preservations of highly sensitive waterways.



***Sums do not equal total conserved lands as protected areas overlap by theme.**

Limitations

- The Development Constraints overlay has varying levels of protection, from hard title commitments to the softer difficulty of developing on steep slopes. It offers one perspective on prioritizing conservation efforts. Each constraint input should be considered independently.
- Development Constraints do not offer protection for systems. This is especially important for Water Quality and Quantity as upstream impacts to water corridors can have significant impacts downstream, so partial protections of waterways do not indicate the watershed as a whole is protected.



View an interactive, zoomable version of this map at the project website's ArcGIS Hub.

Chapter 4: Our Solutions

Introduction

To meet the community's vision as outlined in this Plan, this chapter provides recommendations that could be implemented to better protect and manage sensitive lands while balancing private property rights. When implemented these recommendations would:

- improve wildlife habitat and quality of life for the community residing in Gallatin Valley
- improve climate resiliency
- reduce impacts to surface and ground water quality
- promote equitable access to the benefits of preserved sensitive lands across the Valley
- mitigate the impacts of flooding, wildfire, and drought

Recommendations

The following recommendations include a consolidated menu of solutions that various organizations, agencies, and/or partners can choose from. The recommendations may be implemented at various scales from large landscape measures to site specific actions to provide flexibility. The execution of each recommendation will require action by many partners and willing landowners to see actual change on the ground and implementation in policy documents. Collaboration by various entities is important to implementation, which is discussed further at the end of the recommendations

The intent of these solutions is to not lengthen timelines and affect overall costs of projects, including much needed community housing projects. Rather development processes could be improved by providing clearer and more readily available conservation goals and values up-front that could help avoid conflicts later on in the development process when it has become too late or expensive to make changes.

The feasibility of each depends greatly on a variety of factors, including public support, local political will, and the variability of Federal and State laws. Additional details on the ability to implement each recommendation is discussed in the associated narrative below. During implementation additional public outreach will be conducted.

The recommendations build off the science that was used to develop the sensitive lands model. Most recommendations provide benefits to multiple themes which results in an increase in benefit for protecting sensitive lands. The recommendations, where relevant, should integrate and refer to the sensitive lands model results. Additionally, the utilization of the sensitive lands mapping is called out as a separate recommendation to provide further guidance.

The chapter ends with direction on how to implement this Plan through identification of some of the partnerships and funding sources available, as well as methods for monitoring and updating this Plan to ensure the document and models remain relevant.

Many of these recommendations would still need further exploration into their feasibility – including palatability and legality. For recommendations that already exist, such as conservation easements, this would be an exercise in looking into the feasibility of maintaining and expanding current programs. Whereas for recommendations that are not in place yet, such as overlay zoning, it would be looking into the feasibility of developing new programs and/or regulation.

If a recommendation is not listed, it is not precluded from being implemented in the future. Through adaptive management, emergence of new science or partners, or additional analysis other recommendations may be available in the future.

Education is important initially, no matter the level of implementation.

Recommendations Overview

Recommendations are organized by Tiers, depending on how many of the core themes are protected, enhanced, or managed by the tool. Each recommendation includes:

X.X RECOMMENDATION CATEGORY/NAME

Overview

Includes a description of the recommendation details, how the tool works, and its benefits to sensitive lands.

Theme

Identifies the related theme(s)

Implementation Strategy

Building on the methods, strategies detail the considerations and steps needed for implementation.

Implementation Methods

Describes the various ways the recommendation can be implemented, including:

- ☐ Capital improvement: physical projects or infrastructure investments
- ☐ Development code update: changes to jurisdiction land use, subdivision codes, and requirements for future development.
- ☐ Education: resources and training provided in conjunction with implementation partners on how specific efforts or recommendations would benefit sensitive lands, encouraging property owners to take action.
- ☐ Funding opportunity: grants or loans available to support implementation of another recommendation or individual property owner efforts to support sensitive lands.
- ☐ Incentive: recommendations that provide incentives, which could be monetarily or procedurally, to take action.
- ☐ Legislative initiative: recommendations that would require a legislative change to be implementable.
- ☐ Policy/program: new City/County policies or programs that support protection of sensitive areas.

**Implementation Methods and Partners with the box checked (☑) indicates these measures apply.*

Current Use

Recognizes if the recommendation is currently in use in the Gallatin Valley.

Recommending Plan/Source

Identifies the adopted plan, guiding document, and/or literature that supports this recommendation. Recommendations often align with those in existing plans and goals (current development codes, Growth Policies, Triangle Plan, Bozeman's Climate Plan and Community Plan as well as affordable housing goals, equity & inclusion plans) to avoid unintended consequences.

Implementation Partners

Lists the type of entities that could be involved in implementation.

Examples and Case Studies

Links to example projects and/or reference documents.

List of Recommendations

The recommendations are organized first by the primary recommendations provided by the Working Group. These recommendations were prioritized by the Working Group as having the greatest impact on the protection of sensitive lands. Tier 1 recommendations are further categorized into respective themes. Tier 2 provide additional recommendations that are or could be available. They are listed in alphabetical order. A handful of recommendations are identified as Tier 3, which need further evaluation on their impact to sensitive lands.

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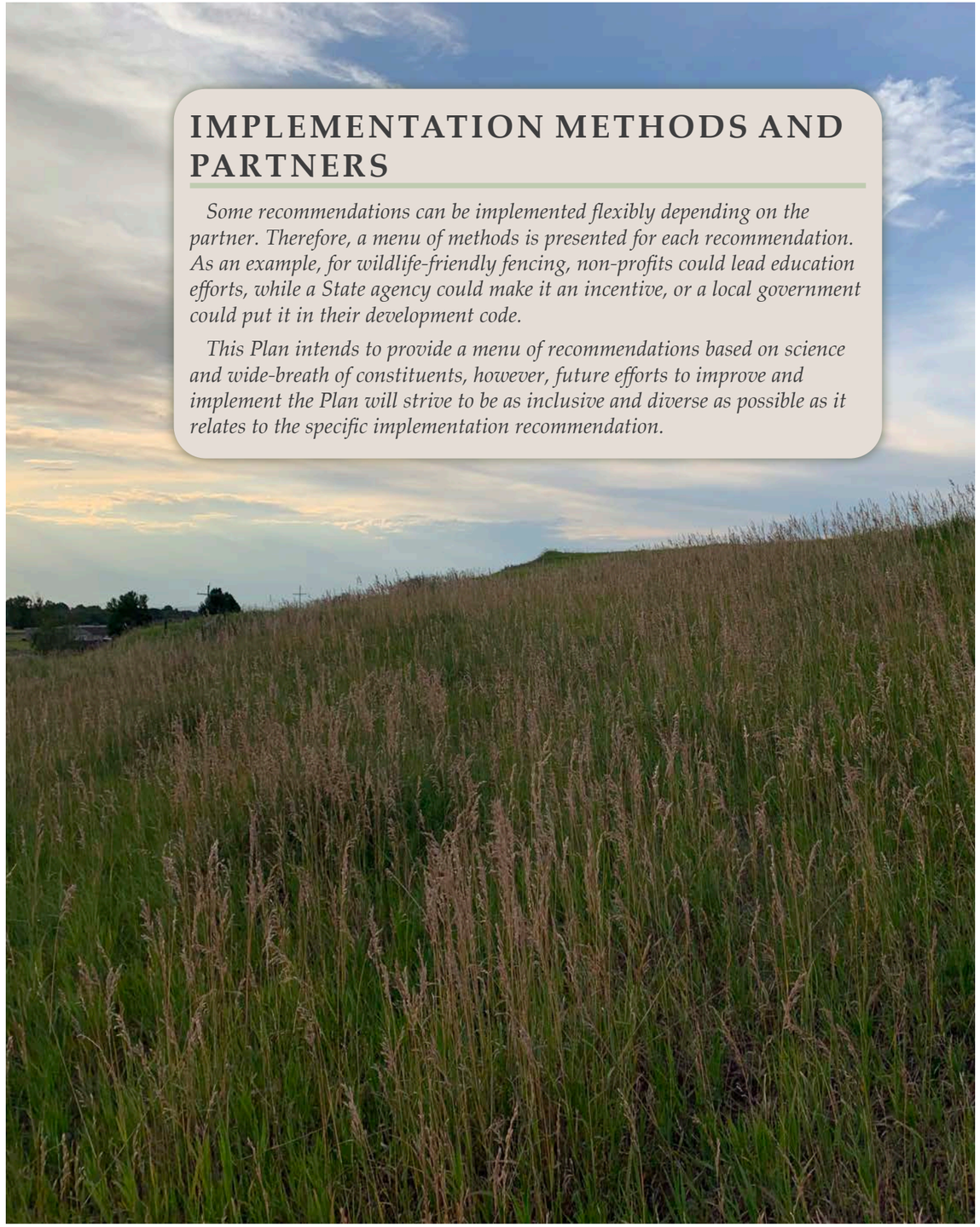


IMPLEMENTATION METHODS AND PARTNERS

Some recommendations can be implemented flexibly depending on the partner. Therefore, a menu of methods is presented for each recommendation. As an example, for wildlife-friendly fencing, non-profits could lead education efforts, while a State agency could make it an incentive, or a local government could put it in their development code.

This Plan intends to provide a menu of recommendations based on science and wide-breath of constituents, however, future efforts to improve and implement the Plan will strive to be as inclusive and diverse as possible as it relates to the specific implementation recommendation.

1. Tier 1 Recommendations

1.1. Broad Scale Protections

1.1.1. Land Use Regulation Reform

A strategic and thoughtful approach to zoning is critical for protecting sensitive lands and aligning with community values. Development of zoning districts requires reviewing existing zone district standards to verify whether existing zone districts are meeting the needs of the community and result in desired outcomes.

When there is no zoning, jurisdictions have limited ability to enforce any zone district specific restrictions, especially density bonuses and restrictions, transfer of development rights, expanded agricultural uses, and overlay zoning. In order for the majority of the regulatory recommendations detailed in this document to be implemented, a future land use map and zoning must be implemented first.

According to the Gallatin County Growth Policy (2021), approximately 70% of private land in Gallatin County—roughly 965 square miles—lies outside of a zoning district or neighborhood plan boundary. This unzoned area is approximately 56% of the total Sensitive Lands study area. Implementing zoning to this large area would potentially greatly advance the goals of this study. In these areas development characteristics vary slightly, but most of the existing development is on larger agricultural parcels, with little to no infrastructure or public services to support higher-density development. This pattern of development is difficult and costly to service and can degrade high-value natural resource areas and increase development pressure on surrounding agricultural areas.

Overlay Zoning

Overlay zoning can be used to accomplish several sensitive areas protections, ranging from agricultural protections to floodplain and riparian overlays to wildlife corridor overlays. Overlay zones provide the flexibility to provide stricter standards across multiple traditional zoning districts at once and avoid the need to modify multiple zone districts. It should be noted that any of the standards listed in these overlay zones could be incorporated directly into base zone district standards rather than as overlay districts.

While each of these overlays serves a different purpose, both could include limitations on placement of disturbance or development, require larger minimum lot sizes, and could modify the density allowances and permitted uses of the underlying zone districts to restrict development and mitigate impacts to sensitive areas.

Subcategory

Broad Scale Protections

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☑ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Current Use

Yes – needs to be improved

Recommending Plan/Source

County Growth Policy, Literature Review

Examples and Case Studies

Countywide Zoning

Chapter 2 Zoning Districts Missoula County, MT

Overlay Zoning

Blaine County, ID- wildlife overlay district, wetland overlay district, agricultural district

Agricultural Overlay

Agricultural overlays can be used to preserve the availability of agricultural lands for farming and provide stability to the farming economy. The goal of an agricultural overlay is to limit development based in identified areas to preserve and support land suitable for farming, while discouraging other uses which would affect the ability of agricultural operations to continue. To develop an agricultural overlay, the local government designates areas where agriculture is intended to be the principal use. Agricultural overlays may be based on existing use as well as soils data. It has been shown that limiting the impacts of development on prime soils can be an effective method of supporting active agricultural lands and mitigating further loss of these lands to development. Many ordinances require developers to explain why they are unable to develop on non-prime soil or farmland before they can encroach on existing farmland. Soil compaction limitations have also shown effective in reducing loss of prime soils. Agricultural overlays are often tied to cluster subdivision standards by limiting the location and size of nonagricultural uses to a portion of a lot.

Wildlife Corridor/Habitat Overlay

Wildlife habitat or corridor overlays are used to provide specific protections for wildlife habitat and species of local, statewide, and national significance. Standards in these overlays could require additional development setbacks, density restrictions, no-build zones, development design standards, and other restrictions to limit human interference with identified priority wildlife habitat and migration corridors. These overlays generally function similar to wetland protections and require mitigation of impacts, a conservation plan, and a habitat analysis to identify key habitats. Note, the corridor models used in the sensitive lands model are not at a scale that can determine plot by plot connectivity in detail.

Implementation Strategy

County zoning, whether countywide or overlay zoning, is implemented through Gallatin County zoning regulations but is required to be based off a future land use map for the County. Gallatin County initiated a public planning process in Fall 2023 to develop the future land use element and map, as described below. Gallatin County does have zoning now, but there are many areas which are currently unzoned. In order to better protect sensitive lands, the portions of Gallatin County that aren't already zoned should be strategically zoned and appropriate development standards should be developed. Zoning regulation reform would be led by the Gallatin County Planning Department and would likely include a full public process including public meetings, a steering committee, public comment period, and public hearings.

1.1.2. Growth Policy/Future Land Use Element

Overview

Future land use maps illustrate the desired mix, character, and location of future land uses within a community. Future land use maps may also define the planning and growth boundaries for municipalities within a County using water and sewer serviceability analyses as well as existing land use and sensitive area analyses. The future land use map establishes the long-term physical growth strategy for the community; however, it does not predetermine exact land uses or densities for given parcels of land. The future land use map is advisory and does not change the existing zoning or the ability of landowners to continue existing legal uses consistent with the current zoning. Any adopted zoning must be based on a future land use map. All municipalities in the planning area have adopted growth policies with future land use maps.

The future land use map coupled with the goals and policies of the Gallatin County Growth Policy, and other applicable growth policies will guide development patterns, infrastructure improvements, and the general character and location of neighborhoods, commercial areas, and amenities, such as parks and schools. The Future Land Use Map can also be used to identify priority areas for conservation and open space. When future development is proposed within the County, the general recommendations of the future land use map form the basis for future zoning designations and updates to zoning and subdivision regulations. While designations found on the future land use map generally indicate the intended primary use and suggested residential density for a particular area, zoning districts specifically define allowable uses and contain the design and development regulations for those intended uses. Zoning sets the policies and laws governing the use, bulk, height, density, and other physical or operational characteristics on a specific site.

The development of a future land use map for Gallatin County was identified as a key short-term goal of the 2021 Gallatin County Growth Policy and was initiated in Fall 2023. This process includes additional public review and approval by the County Planning Board and County Commission. A Gallatin County future land use map could be used to guide the application of the Growth Policy at different geographic scales throughout the County in addition to the Land Planning Map and Matrix in Chapter 5 of the Gallatin County Growth Policy. The development of the Future Land Use Map will be guided by the Growth Policy's vision and grounded in the realities of existing development in Gallatin County, as identified in the map and matrix.

Implementation Strategy

Development of a future land use map is a priority short-term goal of the Gallatin County Growth Policy and is being led by the Gallatin County Planning Department, will involve a community engagement process, and should include coordination with the future land use maps of incorporated areas within the County to ensure complimentary uses along the county interface areas. The future land use map would be adopted as an element of the County Growth Policy.

Subcategory

Broad Scale Protections

Implementation Methods

- ☐ Capital Improvement
- ☐ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Missoula County Growth Policy and Land Use Map | Missoula County, MT

Flathead County Growth Policy and Land Use Map | Flathead County, MT (Partial)

Current Use

The County Growth Policy future land use map is under development.

Recommending Plan/Source

County Growth Policy; Protecting Wetlands (2008); Bozeman Community Plan 2020; required by state law for Bozeman and Belgrade

1.2. Incentive Based Conservation for Individual Parcels

1.2.1. Land Acquisition

Overview

Direct land acquisition uses funds from grants, bond measures, or state/federal programs, general funds, land dedication, park impact fees, land swaps, or other local, state, and federal sources. Direct acquisition is an effective tool because it pays landowners for conservation and demonstrates a dedication from the local government to advancing conservation, public health, safety and welfare, and public recreation goals. Across Montana local, state, federal, and private entities often purchase land for these purposes from landowners. Lands that are constrained are often dedicated or purchased based on their usable value. Land acquisition is a reliable means of conserving core habitats and corridors between habitats.

Gallatin County, municipalities, or local non-profit organizations can purchase land for conservation purposes. For the City of Bozeman and other municipalities, strategic acquisition of city parkland in a way that promotes the protection and enhancement of intact, contiguous sensitive lands, empowers the city to play an active role in natural resource conservation and stewardship. Parks acquired as part of land development requirements must provide recreational services for the residents of the development.

Parks are a powerful tool for a sustainable future: by owning and managing natural areas, riparian corridors and wetlands in particular, the city can be better positioned to actively build climate resilience, protect wildlife habitat, and improve water quality.

Implementation Strategy

Gallatin County, municipalities, or local non-profit organizations can purchase land for conservation purposes. Land acquisition is accomplished through direct purchase of properties, using funding from grants, bond measures, or state/federal programs, general funds, land dedication, park impact fees, land swaps, or other local, state, and federal sources. The Sensitive Lands Plan and maps can be used to guide parkland acquisition and developer dedication in accordance with 76-3- 621 Montana Code Annotated.

Subcategory

Incentive Based Conservation for Individual Parcels

Implementation Methods

- ☑ Capital Improvement
- ☐ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Montana DNRC | Land Acquisition Portfolio

Habitat MT Fund and Headwaters Community Housing | StoryMill Park

Current Use

Minimal

Recommending Plan/Source

County Growth Policy, PRAT Plan, 2020 Bozeman Community Plan

1.2.2. Conservation Easements

Overview

Conservation easements are voluntary agreements between the landowner and a land trust or unit of government that permanently limit the uses of the land. The specific terms of a conservation easement are negotiated between the landowner and the organization holding the easement and vary based on the conservation goals and features of the property. Terms may include limiting the size and type of development, limiting permitted land uses, and easement monitoring requirements.

Conservation easements can be tiered to provide greater protections, and more restrictions, for areas sensitive to development (such as wetlands, riparian and floodplain areas, and some wildlife habitat) and can be flexible in areas where development may allow for preservation, such as agricultural lands. This tiered easement system balances the community goals of preserving sensitive areas with private property rights and accounting for future growth.

Landowners choose to place a conservation easement on their land for a variety of reasons, including tax advantages and monetary compensation in some cases. While most conservation easements are non-compensatory, meaning the landowner is not paid for the conservation easement beyond the tax benefit, over 50% of conservation easements held by the Gallatin Valley Land Trust (GVLT) are "bargain sale" where the landowners received compensation for their easement. Conservation easements can also receive voluntary development incentives like density bonuses, or in combination with Transfer of Development Rights (TDR) programs or cluster developments to ensure open spaces are protected in perpetuity. A conservation easement incentive in the form of a tax benefit change is posited in the Gallatin County Growth Policy but would require a legislative change at the state-level.

Purchase of conservation easements by a land trust or unit of government has been successful for properties that contain important views, are adjacent to waterways, or are agricultural lands adjacent to municipalities where development pressures are high. The purchase of conservation easements demonstrates a financial commitment to protecting sensitive areas and builds a partnership with landowners and the community. The purchase of easements can facilitate large-scale landscape preservation when conservation easements are adjacent to other protected lands.

Implementation Strategy

Montana is a national leader in conservation easements. The Gallatin Valley has multiple active land trusts working together with landowners and public agencies to strategically expand conservation. Continued support and partnerships are critical.

Requirements for conservation easements are often included in zoning and subdivision regulations to incentivize conservation practices or permanently protect land in exchange for density bonuses, but conservation easements may be incentivized outside the community's regulations. Local governments and partners can incentivize locating conservation easements in close proximity to one another to better support agricultural uses. Further, the state could reform tax benefits to provide a greater incentive for conservation easements, similar to those in Colorado.

Subcategory

Incentive Based Conservation for Individual Parcels

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☑ Incentive
- ☑ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☑ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Montana Land Trust Alliance | Conservation Easement FAQs

Water Education Colorado | Conservation Easements

Current Use

Yes

Recommending Plan/Source

County Growth Policy; Protecting Wetlands (2008)

1.2.3. Channel Migration Zone Easements

Overview

The Channel Migration Easement (CME) program is a new type of conservation easement in which landowners within the river's 100-year channel migration zone agree not to armor the river banks to stop natural erosion and sediment deposition.

CMEs pay riverbank landowners to let a large river migrate naturally across the floodplain, so that the important processes of erosion and sediment deposition can continue. They protect the financial interests of landowners, while preserving the river's natural functions and protecting vital aquatic habitat. The CME would support conservation and restoration of waterways for protection of clean water resources for humans and wildlife. CMEs are designed carefully and flexibly to give the river room to roam within the historic channel migration zone, but landowners set the boundaries. Prior to implementing a CME, landowners are provided channel migration zone maps, indicating what parts of their property are more subject to erosion and deposition over time.

In return, the landowner is financially compensated for potential losses from future channel migration or flooding — protecting their financial interests while preserving the river's ability to freely migrate across its floodplain and create aquatic habitat in perpetuity. Landowners are compensated for giving up their right to install features such as armor, levees, dikes, or flow deflectors that reduce a river's ability to naturally migrate and access its floodplain. The CME option is especially attractive to landowners who wish not to spend up to hundreds of thousands of dollars to install riprap, and risk losing that riprap in a high flood event, but instead receive compensation for lost land either through a direct cash payment or through tax deductions for a donated conservation easement. Landowners retain their rights to manage their acreage for agricultural production, irrigation, recreation, etc.

Implementation Strategy

Similar to regular conservation easements, willing landowners voluntarily enter into an agreement with a land trust to document the existing conditions and detail the future restrictions. The conservation easement is a long-term agreement between the landowner and land trust to monitor the property. Typically the entire property is placed under an easement. The process to establish a channel migration easement includes: landowner engagement, due diligence, easement and land appraisal, developing and finalizing easement terms, agency review and approval, and landowner acceptance. Channel migration easements may include a fundraising stage, depending on the landowner's willingness to donate the easement for tax purposes. The process concludes with the full execution of a final purchase and sale agreement, closing the transaction, and recording of the conservation easement on the property title. Coordination with local watershed groups to monitor, restore, and enhance may be beneficial.

Subcategory

Incentive Based Conservation for Individual Parcels

Implementation Methods

- ☐ Capital Improvement
- ☐ Development Code Update
- ☑ Education
- ☑ Funding Opportunity
- ☑ Incentive
- ☐ Legislative Initiative
- ☐ Policy/Program

Implementation Partners

- ☑ Individual Property Owners
- ☐ County
- ☐ Municipalities
- ☑ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Montana Aquatic Resource Services White Paper

Current Use

No

Recommending Plan/Source

Literature Review, Working Group

1.2.4. County Open Space Levy & Program

Overview

The Gallatin County Open Space Tax & Program, also known as the Open Space Levy, was passed by Gallatin County voters in 2018. The Open Space Levy functions like a purchase of development rights where development rights are purchased by Gallatin County and extinguished. Similar to TDR programs, The Open Space Levy is voluntary and requires a property owner to be willing to sever their development rights from the physical land. Like many other recommendations, a conservation easement is usually placed on lands where development rights are sold to prevent future development.

The Gallatin County Open Space Levy allows the County to levy up to 4.5 mills annually for open space-related purposes consistent with the ballot language. Of the 4.5 mills levied, 0.5 are transferred to the parks fund for capital improvements and maintenance needs of County-owned parks. The remaining mills are split between "Conservation Projects" (81%) and "Other Eligible Projects" (19%). Conservation Projects are related to the purchase of land and conservation easements to conserve farm and ranch lands, provide recreation, protect water quality of streams and rivers, manage growth, and protect wildlife areas. Other Eligible Projects are capital improvements and maintenance projects that support the purpose of the Open Space Levy. Funds not allocated can be rolled over to the next fiscal year. The Open Space Levy is set to expire at the end of the 2033 fiscal year.

Applications for "Conservation Projects" can be submitted in the fall, and the "Other Eligible Projects" application cycle occurs in the spring. Applications for both types of projects are reviewed by the Planning and Community Development Department in conjunction with the Open Lands Program administrator and the Board of County Commissioners, applicable citizens' advisory committees, and stakeholders based upon administrative policies and processes, and the scoring criteria identified in the application forms.

Implementation Strategy

Renewal of the Open Space Levy would require a vote by the Board of County Commissioners and approval by the Gallatin County voters on the ballot. The Sensitive Lands mapping could be used as a way to objectively score future allocations.

Subcategory

Incentive Based Conservation for Individual Parcels

Implementation Methods

- ☐ Capital Improvement
- ☐ Development Code Update
- ☑ Education
- ☑ Funding Opportunity
- ☐ Incentive
- ☑ Legislative Initiative
- ☐ Policy/Program

Implementation Partners

- ☑ Individual Property Owners
- ☑ County
- ☐ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Gallatin County, MT Open Space Levy Application

Gallatin County, MT Open Space Levy 2023 Funded Projects

Blaine County Land, Water & Wildlife Program | Blaine County ID

Current Use

Yes – expires in 2033

Recommending Plan/Source

Literature Review

1.2.5. Transfer of Development Rights

Overview

Transfer of development rights (TDR) programs are voluntary programs which allow landowners to sever their development rights from the physical land, and those separated development rights become a tradable commodity that can be bought and sold. When a landowner chooses to separate some, or all, development rights, the property is preserved through a conservation easement, similar to cluster developments. TDR programs require a willing seller and buyer for the development right, but participation in the program is voluntary.

The goal of TDR programs is to direct development away from areas that communities want to preserve – known as sending areas – and into areas where development is more appropriate – known as receiving areas. Development transfers within a TDR program may be either contiguous or non-contiguous, depending on the program standards. Sending areas are generally areas of "high-value", whether that be historic, cultural, agricultural, or ecological value, whereas receiving areas are areas where there is availability of facilities, services, public transit, and proximity to existing development.

Like other recommendations, TDR programs are most effective when they are combined with other conservation tools like density bonuses, cluster development standards, and natural resource setbacks. The most successful TDR programs – those that result in numerous development rights transfers which protect desired areas – have strong community support, capacity for municipalities to service additional development, few alternatives to TDR programs, landowners willing to sever development rights, high demand for bonus development, and customized receiving areas. Demand for bonus development and customized receiving areas are noted as defining features of successful TDR programs because without a demand for bonus density, or base zoning allowances in the receiving areas that allow for additional density, there is no incentive to pay for additional development rights. Similarly, customized receiving areas are key to a functioning TDR program because they ensure that there is infrastructure capacity to serve the development, that increased density is compatible with existing development and the comprehensive plan, and that density is permitted in locations where developers perceive there is a market for higher density. The use of a bank, or clearing house, for facilitating development transfers has also been effective by allowing the sale of development rights without needing to locate a buyer for that development right.

Implementation Strategy

Development of a TDR program would be most effective if the effort were combined with a countywide future land use map (FLUM) or zoning effort. Sending and receiving areas within a TDR program can be designated on a FLUM and/or as a zoning overlay in the zoning regulations. Sending and receiving areas should be in alignment with the Gallatin County Growth Policy, City of Bozeman Comprehensive Plan, sensitive lands mapping, and meet the needs of the community.

Subcategory

Incentive Based Conservation for Individual Parcels

Implementation Methods

- ☐ Capital Improvement
- ☐ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☐ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Conservation Tools | TDR Overview

Center for Land Use Education | TDR Overview

Blaine County TDR Program | Blaine County, ID

King County TDR Program Overview

Current Use

None

Recommending Plan/Source

County Growth Policy; Bozeman Community Plan, Protecting Wetlands (2008)

1.3. Subdivision and Housing

1.3.1. Subdivision Regulation Reform

Overview

Subdivision reform can refer to a variety of subdivision regulation updates from development standard requirements, procedural changes, and impact mitigation. In order to preserve sensitive areas, subdivision reform in Gallatin County and the City of Bozeman should focus on developing specific development standards related to sensitive lands, as directed by the Gallatin County Growth Policy. The Gallatin County Growth Policy states that development of all types should minimize impacts to or from hazardous and/or ecologically-important features of the environment and provides the following list of considerations for updates to the subdivision regulations:

Concurrent Infrastructure

- Potable water
- Wastewater and sewer
- Solid waste service
- Roads and bridges
- Pedestrian/bicycle facilities
- Power and other utilities
- Public Services
- Fire protection
- Emergency medical
- Law enforcement
- School capacity
- Libraries
- Parks and open space
- Topographical Features
- Wildfire risk
- Flood risk
- High water table
- Geohazards (slopes, landslides, fault zones, avalanches, etc.)
- Water conveyance facilities
- Watercourses
- Wetlands
- Wildlife and haxbitat
- Prime farmland
- Dark sky lighting

Montana Fish, Wildlife & Parks has compiled a set of fish and wildlife recommendations for subdivision development in the state. These recommendations are primarily intended to guide FWP field biologists when they receive subdivision-related requests for information and input from local governments and subdivision applicants. Recommendations are included for waterbodies, big game winter range, native grasslands and habitats, among others.

Topographical Features

It is important to note that subdivision regulations apply countywide even though Gallatin County is only partially zoned. This means that Gallatin County could further develop setback requirements, wildlife corridor buffers, and wetland mitigation measures based upon sensitive lands mapping. Gallatin County already applies watercourse setbacks and mitigation.

Subcategory

Subdivision and Housing

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☐ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Current Use

Subdivision regulations in both the City of Bozeman and Gallatin County could be updated to promote development with a greater focus on sensitive area protection. Bozeman is currently in the process of updating the Unified Development Codes.

Waterbody setbacks, buffers, and no disturbance areas are in place but could be improved. Bozeman Unified Development Code Section 38.410.100 Watercourse setback, Division 38.600 Floodplain Regulations, and Division 38.610 Wetland Regulations

Recommending Plan/Source

Protecting Wetlands (2008); Literature Review; PRAT Plan

Waterway, Riparian Area, and Floodplain Buffers

Riparian areas, including the upland channel, as well as floodplains that receive intermittent runoff, are highly valuable as corridors for wildlife movement and are important to ensuring water quality. In addition, these areas provide valuable habitat for wildlife, serving as food sources and vegetative structure for nesting and camouflage. Due to their high ecological value, these natural areas should be preserved to the greatest extent possible.

Many Montana communities have adopted riparian and floodplain setback standards of varying widths. Setbacks should be tailored to the local conditions and should consider topography, soils stability, hydrology, and site-specific factors to ensure that setbacks will be effective in preventing development within sensitive areas while still balancing private property rights. To preserve the integrity of the protected areas within the buffers, buffers should remain free of structures, developed recreational amenities, and any grading or soil and vegetation disturbance actions. Additionally, access to these protected areas by off-road vehicles should be prohibited, to reduce negative impacts to wildlife, floodplain protection, soil erosion, and to protect the native vegetation. Recreational activities not requiring developed recreation amenities like permeable paths, permeable parking areas, or permanent disturbance of vegetation or soils are generally permissible within buffers. Related to development setbacks are maintenance and invasive species control measures which can be developed for floodplain and riparian areas.

Setbacks and Buffers from Active Agricultural Lands

Similar to waterbody and riparian area setbacks, active agricultural land setbacks can provide a buffer between active agricultural operations and other potentially conflicting uses to protect active agricultural operations and reduce nuisance complaints filed against farmers and ranchers based on noise, dust, odors, etc. Setbacks are the defined distance between a use of structure and the edge of the property line or another use or structure. Most communities identify building and use setbacks from the property lines to mitigate negative impacts and incompatible uses. Setbacks are commonly used between potentially incompatible uses and structures to mitigate land use conflicts.

Setbacks and buffers from active agricultural operations have setback requirements on the lot that will be used for nonagricultural purposes, which can help discourage or reduce development in agricultural areas or setbacks may be focused on lot with the active agricultural operation. Buffers, including vegetation, fences or walls, or other screening options may be required in conjunction with or in place of setback requirements. The uses which require setbacks and buffering vary from community to community. Some communities require setbacks only for specific types of development such as condominiums and residential subdivisions, and some communities require minimum setbacks for all new development adjacent to agricultural land. Setbacks do not have to be a fixed number and can be on a sliding scale based on the intensity and size of the uses, as well as site-specific features.

Examples and Case Studies

Montana Fish, Wildlife & Parks Recommendations for Subdivision Development

Waterway, Riparian Area, and Floodplain Buffers

A Planning Guide for Protecting Montana's Wetlands and Riparian Areas (starting page 34)

MT Counties with Riparian setback standards (2009 doc)

Setbacks and Buffers from Active Agricultural Lands

Sustainable Development Code | Setbacks and Buffers between Non-Agricultural and Agricultural Areas

American Farmland Trust | Farms Under Threat: The State Of The States

Skamania County, WA, Code of Ordinances § 22.14.010

Building Envelope Designation

Teton County, WY Section 5.1.1. Waterbody and Wetland Buffers: Details no-build and on-improvement zones in wetland and waterbody setbacks

Building Envelope Designation

Often paired with setbacks and buffers are specific no-build zones and/or designated building envelopes to prevent development in hazardous or sensitive areas. Building envelopes are often designated on a subdivision plat or site plan to specify where buildings or other structures may be located. Building envelopes shown on a subdivision plat are legally binding and often require an administrative application procedure to relocate the building envelope. In tandem with designated building envelopes are no-build zones, which are areas where the erection of any temporary or permanent building or development is prohibited, such as the area within a setback or areas outside a designated building envelope. Additionally, depending on the sensitivity of the resources, some communities specify areas within a setback where no-improvement zones which prohibit the placement of any structures or fences; motorized vehicle access; site disturbances like grading, road construction, or parking areas; landscaping, planting of nonnative species, or disturbance of native riparian vegetation.

Implementation Strategy

The setbacks and buffers detailed above can be used alone, or in conjunction with other best management practice tools like cluster development. The setback requirements are detailed in zoning and subdivision regulations. Requirements to designate building envelopes on a subdivision plat or site plan and designation of no-build or no-improvement zones would require updates to the zoning and subdivision regulations. The requirements to designate building envelopes or no-build and no-improvement zones are usually based on setbacks and other natural and cultural resources protections within zoning and subdivision regulations or in other state or federal regulatory documents. Subdivision reform, like zoning regulation reform would be led by the planning departments and would include a full public process including public meetings, a steering committee, public comment period, and public hearings.

1.3.2. Consider Protection Measures when Implementing PUDs/PDZs

Overview

Gallatin County's development code allows for Planned Unit Developments (PUDs) and the City of Bozeman's development code allows for Planned Development Zones (PDZs), which are negotiated developments that deviate from the standard subdivision and zoning requirements. PUD/PDZs provide flexibility in design to allow for creative development and often allow for increases in density beyond what traditional zone districts allow. However, the flexible standards and increased density in sensitive areas can be detrimental to preservation. Due to the fragility of many of the same sensitive areas identified in this plan (wetlands, riparian areas, priority wildlife habitats, productive agricultural lands, etc.), many communities prohibit the use of PUD/PDZs which allow for increased density in sensitive areas.

Teton County, ID had a provision in their land development code that prohibited PUDs in some portions of the county to preserve rural character and critical wildlife areas. In 2022, when Teton County updated their development code and rezoned the county, they removed PUDs entirely. Other communities with PUD restrictions in sensitive areas require conservation easements for sensitive areas, greater open space requirements, habitat mitigation, and/or visual impact mitigation.

The City of Bozeman PDZ provides another alternative to removing PUDs entirely. by allowing the applicant to request an adjustment or waiver of any non-procedural city development standards if that adjustment or waiver will contribute to reductions in water consumption, non-renewable energy consumption, or traffic generation when compared to development of a similar type under the reference base district standards. This could be broadened to apply to other sensitive area protections like wildlife habitat protections, agricultural land preservation, or connectivity. Additionally, the City of Bozeman can look to existing environmental standards and benchmark systems like The Sustainable SITES Initiative, which provides a comprehensive framework for designing, developing and managing sustainable and resilient landscapes and outdoor spaces.

Implementation Strategy

PUD allowances in sensitive areas would require updates to City and County development codes. Updates to the PUD standards could be paired with an overall county zoning effort to achieve desired development patterns countywide. In many communities with sensitive cultural and natural resources, PUD allowances are being replaced with more tailored zoning and development standards as part of a comprehensive zoning and subdivision regulation update to better preserve sensitive areas and provide greater predictability to residents. However, the City of Bozeman PDZ process could be re-envisioned to encompass other sensitive areas identified in this plan. The Gallatin County PUD process could also be re-envisioned to more closely align with the City of Bozeman PDZ process to provide more flexibility in design, minimum lot size, and other development standards to allow for development to be directed out of sensitive lands.

Subcategory

Subdivision and Housing

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☐ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Limiting PUDs Near Sensitive Natural Areas FAQ | Sustainable Development Code

Kane County Subdivision Regulations §19-137 | Kane County, IL

Teton County Subdivision Regulations (2013 archive; were revised in 2022) | Teton County, ID

Current Use

PDZs and PUDs are allowed in some areas by both the City of Bozeman and Gallatin County development codes.

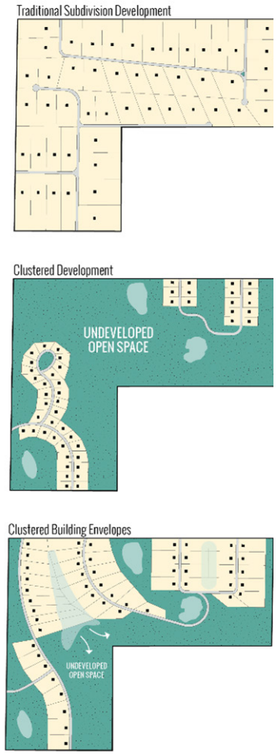
Recommending Plan/Source

Literature Review

1.3.3. Conservation-Oriented/Cluster Development

Overview

Conservation-oriented development, also known as cluster development, refers to development design driven by ecological-based planning to conserve the land with the highest resource values and minimize vegetation loss, habitat fragmentation, and increase connectivity. This type of development plans with adjacent land uses in mind to maintain connectivity of open space and includes development practices, like density bonuses, transferrable development rights, and conservation easements. Conservation-oriented development enables developers to capitalize on premiums that home buyers are willing to pay for access to natural amenities, but protected land is often managed by a homeowners' association. Conservation-oriented development presents a compact layout, reduces number and length of roads and driveways, works with the natural flow of streams, and site development, staging, and storage is located in previously disturbed areas.



Cluster development allows for grouping of residential structures by reducing minimum lot area requirements and incorporating the remaining area as open space. Cluster development has been effective in reducing impacts to wildlife, protecting natural resources, and minimizing disturbance.

Implementation Strategy

Clustered development is often implemented through zoning and subdivision regulations and are often paired with density bonuses to catalyze their use.

In the implementation of cluster development standards, it is important to consider where clustering is allowed and what water and wastewater provision will look like. Cluster development can be achieved without requiring community water and wastewater systems depending on density and lot size. Best practice is to encourage new development to tie to existing municipal or water/sanitation district systems. Requiring community well and septic systems for density bonuses could disincentivize the use of density bonuses due to state and federal requirements for maintenance and operation of community water and wastewater systems. Allowed cluster development densities should be aligned with any applicable zoning regulations and future land use designations.

Subcategory

Subdivision and Housing

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Missoula, MT

Cluster Development Model Ordinance Chesco County, PA

Friends of Verde River, AZ Model Cluster Development Ordinance

Current Use

Yes, County has some zoning districts that allow for clustering

Recommending Plan/Source

County Growth Policy; Protecting Wetlands (2008)

1.3.4. Density Bonuses

Overview

Density bonuses allow increases in the maximum allowed density in an area or zone district in exchange for providing community benefit. As an incentive for providing community benefit which meets defined community goals, density bonuses provide developers the ability to meet financial metrics at the time of subdivision. Density bonuses provide a direct incentive to a developer without requiring complex negotiations often associated with transfer of development rights (TDR) programs. Density bonuses can be used to accomplish land preservation, affordable housing development, historic preservation, infill development, and transferring density. A density bonus program can be developed as a standalone tool, but more commonly, density bonuses are used in tandem with other conservation tools to catalyze use. Density bonuses vary greatly in scale and success. The most successful programs are in communities with strong market demand for land but limited available land. When the bonus is not high enough to provide a true incentive for development, or where there is ample land, programs are underutilized. Programs that are highly utilized are also designed to provide density bonuses to address multiple community goals, rather than singularly-focused programs.

Density bonuses programs allow increases in density through reduced minimum lot sizes, increased number of dwelling units, increased height allowances, increased Floor Area Ratio or increased square footage allowances. Density bonus programs can be designed to allow relief from standards which may inherently limit the allowed density in an area, such as reduction in parking requirements, building setbacks, or site disturbance maximums. Many programs provide tiered bonuses where the degree of increase is dependent upon the level of community benefit.

Implementation Strategy

Density bonus programs are included in the county's or municipalities' zoning and subdivision regulations. Density bonus programs can be developed as a standalone tool but are more commonly used with cluster subdivisions, TDR programs, and conservation easements to incentivize their use. The most effective density bonus programs have administrative approval and clear criteria. If density bonuses require extra public hearings or subjective criteria for approval they will rarely be used due to the real or perceived risk of delay and additional cost.

In the implementation of density bonuses, it is important to consider where they are allowed, the criteria for receiving the bonus, and water and wastewater provisions. Density bonuses can be achieved without requiring community water and wastewater systems depending on final density and lot size. Best practice is to encourage new development to tie to existing municipal or water/sanitation district systems. Requiring community well and septic systems for density bonuses could disincentivize their use due to state and federal requirements for maintenance and operation of community water and wastewater systems. Allowed densities should be aligned with any applicable zoning regulations and future land use designations.

Subcategory

Subdivision and Housing

Implementation Methods

- ☐ Capital Improvement
- ☐ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☑ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Colorado Department of Local Affairs Planning for Hazards Toolbox Density Bonus Model Code

Montana Department of Transportation | Density Bonuses

Whitefish, MT Density Bonus Program

Missoula, MT Density Bonus Program

Current Use

None (However, the City of Bozeman's PDZ program provides some flexibility if certain criteria are met)

Recommending Plan/Source

County Growth Policy; Literature Review

1.3.5. Septic Restrictions

Overview

In areas of high groundwater requiring enhanced treatment systems or engineered wastewater systems has been effective in mitigating water contamination due to septic and wastewater systems. Wastewater system limitations may vary depending on how restrictive they are, ranging from prohibiting individual septic systems, to permitting them under limited circumstances, to requiring enhanced treatment systems. These restrictions may be implemented separately or in conjunction with one another, depending on the jurisdiction and permitting agency (local or state Department of Environmental Quality).

Continued use of individual septic and well systems on small lot subdivisions is not sustainable from the standpoint of maintaining valley groundwater and river water quality. As a result, decentralized waste systems, commonly referred to as community or shared septic systems, have begun to rise in popularity due to their ability to allow multiple users to connect to a shared septic tank or field. In many cases, shared septic systems have been encouraged because they allow for smaller lot and clustered development that can preserve open space, mitigate water impacts, and protect wildlife habitat. However, many developers are hesitant to use shared septic systems because of the high construction costs, state regulations regarding operations and maintenance of systems, and possible civil issues between users regarding maintenance and repair of the system. Long-term operations and upkeep of shared systems can pose a burden for landowners who are not trained in the complexity and legalities of operations. Best practice is to encourage new development to tie to existing municipal or water/sanitation district systems. Requiring community well and septic systems for development could disincentivize the use of specific development incentives or tools in this plan due to state and federal requirements for maintenance and operation of community water and wastewater systems.

Implementation Strategy

Requirements for wastewater treatment are a combination of requirements from DEQ and regulations adopted by the City-County Board of Health. Coordinate with the Gallatin City-County Health Department during the 2024 County Health Code update to revise onsite wastewater disposal design and permitting requirements.

Subcategory

Subdivision and Housing

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☐ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

US Environmental Protection Agency Septic System Types

Mason County, WA Shared Septic System Standards

Current Use

Yes – Needs improvement

Recommending Plan/Source

Literature Review

1.3.6. Stormwater Management

Overview

Stormwater management standards define specific design site design and generally includes purpose, applicability, and design standards sections. The applicability section should consider the extent of the stormwater issues in the community, and the threshold when stormwater management standards apply. Standards may be tiered to increase standards as the intensity of proposed development increases, and possibly exempt certain types of development from compliance with the standards.

Most stormwater management standards that mandate any type of low-impact development establish a broad requirement that post-development stormwater runoff rates be the same as or less than pre-development rates. Additionally, most stormwater management standards mandate stormwater retention and treatment, impervious surface coverage limits, building coverage limits, parking lot design standards, and landscaping or screening requirements. Some communities have also developed subdivision and lot design standards and some communities have gone as far as to develop incentives to encourage greater stormwater management practices.

Stormwater management standards can be developed as a stand-alone chapter of a zoning or land development code, or they may be integrated into a development standards chapter including other site development standards including access and connectivity, erosion and sediment control, open space, parking standards, and sensitive area protections. Some communities have also adopted stormwater management separate from the community's zoning regulations as technical engineering manuals, stormwater master plans, or other similar documents.

Implementation Strategy

Stormwater management standards implemented through the state subdivision requirements. Stormwater management standards may be adopted as a standalone chapter in the Zoning Regulations, or incorporated into an overall development standards chapter. These standards may also be adopted as a standalone technical document or manual, as well as implemented through design and management of park and facility capital projects.

Subcategory

Subdivision and Housing

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☐ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☑ State/Federal Agencies

Examples and Case Studies

Stormwater Management and Low Impact Design Model Code

Billings, MT | Stormwater Management Manual

Missoula County, MT | Stormwater Management Division Standards

Sidney, MT | Stormwater Management and Erosion Control Ordinance

Current Use

Yes

Recommending Plan/Source

Literature Review

1.4. Implementation Capacity

1.4.1. Revise Environmental Assessment Requirements

Overview

An environmental assessment is a site-specific analysis identifying key wildlife habitats and environmental resources and identifying required mitigation measures for each development to facilitate the connection and continuity of natural resource areas (streams and ditches, floodplains, wetlands, riparian areas, tree and plant species, soils, etc.). Some communities require a habitat analysis for all subdivisions and development proposed in areas mapped as high priority habitat or sensitive areas, and some only require a habitat analysis when physical development like grading or construction is proposed.

Included in the full environmental assessment are a map of the property depicting wildlife activity patterns, streams and ditches, floodplains, wetlands and riparian areas, trees, critical habitats and plant species, and soils; identification of any species that use the property that are listed as endangered, threatened, or are species of special concern; and an impact report describing the impact of the proposed development on the identified habitats and natural resources. The impact report is required to evaluate the discrete and cumulative impacts of the proposed development on the identified wildlife species or natural resources and the time periods during which wildlife will be affected. The impact report would be accompanied by a mitigation plan that describes how the proposed development mitigate impacts of development on wildlife. The Gallatin County environmental assessment which is required as part of the subdivision process fills this role for new subdivision in Gallatin County, but additional language could be added to this section of the subdivision regulations to include assessment of culturally significant resources, and other sensitive areas as defined in this plan. Additionally, the City and County could look to existing environmental standards and benchmark systems like The Sustainable SITES Initiative, which provides a comprehensive framework for designing, developing and managing sustainable and resilient landscapes and other outdoor spaces. This program provides clear guidance for standards and also connects environmental outcomes with community benefit.

It would also benefit Gallatin County to require the environmental assessment to be prepared by a wildlife biologist, ecologist, or similar qualified expert in consultation with the local wildlife management agency. The current subdivision regulations do not specify who is qualified to prepare the environmental assessment. In other communities with environmental assessment requirements, the county develops a list of approved consultants which can perform a environmental assessment, but some communities have hired staff to conduct and/or verify the accuracy of the environmental assessment.

Implementation Strategy

Revisions to the environmental assessment requirements are implemented through Gallatin County or City of Bozeman zoning and subdivision regulations, based on the sensitive areas map in this plan.

Subcategory

Implementation Capacity

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☐ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Gunnison County, CO Environmental Analysis

Teton County, WY Environmental Analysis Pre-Application Checklist

Current Use

An environmental assessment is required for subdivisions in Gallatin County but not for development in the City of Bozeman.

Recommending Plan/Source

Literature Review, PRAT Plan

1.4.2. Dedicated Natural Resource Staff

Overview

Currently many Gallatin County and City of Bozeman staff have a background in natural resource management, but their role is not dedicated to natural resource or sensitive lands protection. Dedicated natural resources staff for either the City or County, that are independent from the Planning Board, could serve a variety of roles including supporting and strengthening the City/County departments that provide review, professional development for existing staff, hiring staff with natural resource expertise, including a standing natural resource position on community development/planning boards, creating a specific Sensitive Lands Board.

Additionally, the implementation of any existing or new rules/regulations for protecting sensitive lands comes down to having knowledgeable people engaged in the process. Having trained and dedicated natural resource staff would provide technical expertise and experience with implementation of many of the tools listed in this plan. Specifically, hiring dedicated staff to verify the environmental assessment recommendations could provide additional benefit to the planning staff by providing expertise and education on habitat and environmental resource protection and mitigation. Dedicated county/city natural resource staff could also allow natural resources to be considered in the design process before developments are too far underway. Further, the analysis could facilitate the connection and continuity of natural resource areas (streams and ditches, floodplains, wetlands, riparian areas, tree and plant species, soils).

Implementation Strategy

Hiring of a dedicated environmental staff member would be the responsibility of the county or municipality. Staff should be integrated in reviewing and updating this Sensitive Lands Protection Plan.

Subcategory

Implementation Capacity

Implementation Methods

- ☐ Capital Improvement
- ☐ Development Code Update
- ☑ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Gunnison County, CO Environmental Analysis

Teton County, WY Environmental Analysis Pre-Application Checklist

Current Use

Staff: Limited, many County and City staff have a background in natural resource management but their role is not dedicated to this.

Recommending Plan/Source

Literature Review, PRAT Plan

1.4.3. Maintain High Quality Data for Floodplain, Wetlands, and Channel Migration Zones

Overview

The maps of watercourses in the Lower Gallatin Watershed including the miles of streams and rivers, canals, and ditches, can become outdated or inaccurate if not maintained. This inhibits the ability of landowners to understand constraints and inhibits the ability of Gallatin County to proactively plan for their protection. Updated mapping of floodplains and channel migration zones (CMZs) would also support the recently adopted Gallatin County floodplain regulations (effective May 4, 2023).

Accurate wetland mapping requires on-the-ground assessment and delineation. Jurisdictional determination as to whether a wetland is in fact a regulatory wetland under the Clean Water Act (CWA) (i.e., falls under the definition of a "water of the U.S.") is a big challenge that affects wetland mapping. Further this definition and what is determined jurisdictional has been in flux. Local permitting and mitigation process for impacts to wetlands which fall outside the jurisdiction of the US Army Corps of Engineers is needed. Local governments may choose to regulate 'wetlands' that fall outside of the water of the US definition.

Implementation Strategy

Updated floodplain mapping is the responsibility of FEMA and updated CMZ mapping was recently completed with grant funds as part of a larger project in the Upper Missouri River watershed. Federal floodplain data sets are available, as well as state datasets for waterbodies, but Gallatin County and the municipalities should check these data sets for accuracy prior to use. After mapping is updated, additional tools would be required for enhanced preservation of wetlands and waterways.

Wetland mapping updates are maintained by the Montana Natural Heritage Program. City of Bozeman staff are currently working on updating their wetland code per policy direction of the City Commission. Local government should work with Montana Natural Heritage Program to maintain a GIS layer of delineated wetlands as they occur with development and identify at the time delineation, which 'wetlands' are CWA regulated, and non-CWA regulated.

Existing Permitting for proposed work in streams, wetlands, floodplains, and waterbodies

Compliance with these permits are required by state or federal law. Additional education and outreach should be implemented to ensure compliance.

Natural Streambed and Land Preservation Act (310 Permit Program)

Montana Stream Protection Act (124 Permit)

Clean Water Act Section 404 Permit

Subcategory

Water Quality

Implementation Methods

- ☑ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Gallatin County, MT Floodplain Ordinance

Gallatin County, MT Floodplain Home Page

Current Use

Yes – needs to be improved

Recommending Plan/Source

Protecting Wetlands (2008)

1.4.4. Wetland Mitigation Banking

Overview

Wetland mitigation banking is the restoration, creation, or enhancement of wetlands in an area, to compensate for unavoidable development impacts to wetlands at another location. Wetland mitigation banking is commonly used for impacts due to new development but may also be used for impacts due to agricultural practices. The US Department of Agriculture developed the Wetland Mitigation Banking Program as a competitive grants program that supports the development and establishment of wetland mitigation banks to make credits available for agricultural producers.

For small impacts and impacts to non-jurisdictional wetlands, the City of Bozeman/ Gallatin County can develop local codes and ordinances to guide mitigation and require off-site enhancements to wetlands. Wetland mitigation banks are most effective when there are a number of projects which have unavoidable impacts to wetland and/or stream resources and where there is an opportunity to off-set those impacts by enhancing or restoring another wetland in the region.

Within Gallatin County, the Sacajawea Audubon Society is working to revitalize the Indreland Audubon Wetland Preserve on the east side of Bozeman and turn it into a mitigation bank. According to the Sacajawea Audubon Society website, the intent of developing this wetland mitigation bank is "to provide a local wetland mitigation option to help offset wetland impacts occurring specifically in the Bozeman and Gallatin Watershed area." The mitigation bank is proposed to be developed in conjunction with Montana Freshwater Partners (formerly Montana Aquatic Resources Services) in order to provide technical expertise and guidance on the cost-benefit-risk analysis of the proposed mitigation bank project, as well as regulatory expertise. This wetland bank would hold credits for developers to purchase whose projects would fill or destroy wetlands in the area. Money used to buy the credits would fund the protection or restoration of other wetlands.

Implementation Strategy

Wetland mitigation banks are often implemented by developing a program in conjunction with landowners, conservation agencies, neighboring local governments, and ecologists. The program should take into account current and desired development patterns, private property rights, sensitive lands mapping, and best practices to ensure the program is sustainable long-term.

Theme

Water

Implementation Methods

- ☐ Capital Improvement
- ☐ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☑ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☑ State/Federal Agencies

Examples and Case Studies

US Department of Agriculture NRCS Wetland Mitigation Banking

Montana Department of Transportation Wetland Mitigation Banking Program

Sacajawea Audubon Society Wetland Mitigation Bank Program

Montana Wetland Mitigation Banks

Current Use

Partially, MDT has a wetland mitigation banking program. Other impacts are mitigated to the Upper Missouri Mitigation Bank on the Jefferson in Twin Bridges.

Recommending Plan/Source

Protecting Wetlands (2008)

1.5. Planning

1.5.1. Regional Infrastructure Planning

Overview

Regional infrastructure planning can be used to minimize Gallatin County's impacts to sensitive lands by directing transportation, water supply, and wastewater planning. By encouraging residential development in areas in proximity to, and with connections to, established infrastructure and incentivizing infill and growth around areas designated for urban growth impacts to wildlife, water systems, and connectivity can be reduced. Development should be encouraged where existing infrastructure, services, and utilities are provided. Gallatin County has a goal to achieve compact, contiguous development and infill, well-planned transportation systems, adequate service provision for community cores and residential areas, and opportunities for agriculture, industry, and business.

Transportation projects often produce unintended consequences for wildlife and habitat. Wetlands, watersheds, and waterways are vital parts of the natural ecosystem and require careful planning to avoid, minimize, and mitigate damage to them as a result of transportation projects. The Federal Highway Administration (FHWA) provides information and guidance to Federal, State, and local agencies in order to preserve the function and integrity of the Nation's wetlands and aquatic ecosystems and how to incorporate habitat and species conservation into planning efforts. Transportation projects should include provisions for maintaining habitat connectivity, such as wildlife crossings. Further compact and efficient transportation systems can improve air quality by reducing vehicle miles traveled thereby limiting stress on the ecosystem.

Implementation Strategy

Coordination between Gallatin County and municipal jurisdictions and unincorporated communities will be needed to encourage efficient infrastructure networks and growth planning. The Gallatin County Growth Policy identifies the creation of a County-wide Transportation Plan as a mid-term priority. During the development of a Transportation Plan, additional partnerships with FWP, MDT, and other agencies can be built upon to integrate wildlife movement and migration into transportation planning and documents.

Subcategory

Transportation Planning

Implementation Methods

- ☑ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

FHWA | Environmental Review Toolkit

Current Use

Yes, updates needed

Recommending Plan/Source

Gallatin County Growth Policy, Bozeman Community Plan, Triangle Community Plan

2. Tier 2 Additional Recommendations Available

2.1. Continue Working Group as Sensitive Lands Advisory Committee

Overview

Advisory committees are often developed following planning efforts to implement the plan and monitor the outcome of new recommendations that result from those planning efforts. Continuation of the Working Group as a Joint Sensitive Lands Advisory Committee charged with reviewing county and city policies, new plans, and regulations, could ensure that the sensitive lands mapping and recommendations from this plan are taken into consideration for new development within Gallatin County. This advisory committee would be non-regulatory and function similarly to the joint planning coordination committee.

Implementation Strategy

The continuation of the working group as a Joint Sensitive Lands Advisory Committee would require development and approval of a charter by the Gallatin County Board of County Commissioners and the Bozeman City Council. Once the charter detailing the duties and responsibilities of the advisory committee is approved, appointment of members would be confirmed by the City Council and County Commission.

Implementation Methods

- ☐ Capital Improvement
- ☐ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Gallatin County Open Lands Board

Larimer County Open Lands Advisory Board | Larimer County, CO

Environmentally Sensitive Lands Oversight Committee | Sarasota County, FL

Land Acquisition Committee | Flagler County, FL

Current Use

Partial, the Gallatin County Open Lands and Planning and Community Development boards as well as the City of Bozeman Sustainability Board provide some of this role.

Recommending Plan/Source

Literature Review

2.2. Dark Sky Lighting

Overview

Lighting is an important safety feature in neighborhoods and can extend the use of amenities after dark, especially during the summer. However, artificial lighting can affect animals that sleep at night and can be disorienting for nocturnal animals and insects, including pollinators like moths. Artificial lighting can also disrupt reproduction and mating cycles; benefit predators to the detriment of their prey; alter migration routes; cause foraging avoidance for many species; and result in building collisions, in the case of birds. In some cases, artificial lighting has also caused mammals to avoid typical habitat areas all together. Light fixtures should be selectively placed, hooded/shielded (i.e., not emitting direct or indirect light above an imaginary horizontal plane passing through the light source), and directed downward and away from nearby natural areas. In areas with evening activities that require lighting, such as sports fields, rodeos, and event centers, the location and timing of activities should be considered and lights should be turned off when not needed. Light fixtures with motion or heat sensors may be used to keep lights off when lighting is not required.

In addition to the location and type of fixture, it is important to consider the physical properties of the light that is produced. The International Dark Sky Association (IDA) recommends using lighting that has a color temperature of no more than 3000 Kelvin. The IDA has developed the Fixture Seal of Approval program to provide objective, third-party certification for lighting that minimizes glare, reduces light trespass, and doesn't pollute the night sky. Gallatin County and the City of Bozeman's standards for lighting in some areas do meet these recommendations. View a database of fixtures here.

Implementation Strategy

Dark Sky lighting can be implemented through County Zoning and Subdivision Regulations as part of the development standards portion of the regulations. Non-profit organizations and government agencies can conduct outreach and develop resources to educate building owners, designers, and contractors on Dark Sky lighting, including best practices and product sources. Incentives, such as rebates for fixtures, can be offered to promote Dark Sky lighting adoption. Dark sky lighting is increasingly important as growth continues in the valley.

Implementation Methods

- ☐ Capital Improvement
- ☐ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☑ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Montana IDA Chapter

Missoula, MT | Outdoor Lighting Ordinance

Bridger Canyon Property Owners Association | Dark Sky Lighting

Whitefish, MT | Outdoor Lighting Ordinance

Current Use

Some areas have standards but there is no countywide standard.

Recommending Plan/Source

County Growth Policy; Literature Review

2.3. Develop and Publicize Land Acknowledgments

Overview

It is important to recognize the history of the Gallatin Valley from an Indigenous perspective as traditional and ongoing stewards of the land. According to Montana State University's website on creating Land Acknowledgments: "Land acknowledgments are sincere statements, used by both Native and non-Native peoples, to recognize that present activities are taking place on the traditional homelands of Indigenous Peoples who have been dispossessed from these lands, are traditional stewards of these lands, and have an ongoing relationship with these lands. An authentic and sincere land acknowledgement conveys both an awareness of the injustices experienced by Indigenous Peoples and a commitment to the work of solidarity and ongoing relationship-building with them." Land acknowledgements are typically shared at the beginning of gatherings and events and are included on public websites. This Sensitive Lands Protection Plan incorporates a land acknowledgment in the preface.

As this plan was developing input, the planning team met with several Indigenous knowledge-holders that have advised and consulted with us to develop a land acknowledgement as a first step in integrating Indigenous perspectives and ways of knowing into this work.

Implementation Methods

In developing land acknowledgments, it is critical to engage the Indigenous community. However, engagement should go beyond land acknowledgments to truly listen, learn, consult, integrate, honor, and create meaningful partnerships with Tribal communities across everyday practices.

Implementation Methods

- ☐ Capital Improvement
- ☐ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☐ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

City of Missoula

Montana State University Guide to Land Acknowledgments

Native Governance Center

Current Use

Partially – Gallatin County and the City of Bozeman are working with Tribal partners to develop land acknowledgments

Recommending Plan/Source

Literature Review, Constituent input

2.4. Expanded Agricultural Land Uses/Investing in Agricultural Operators

Overview

Expanding the allowed uses through reduced restrictions on agriculturally zoned properties to allow agricultural-adjacent uses which complement or support existing agricultural operations can provide an avenue for agricultural operators to continue operating rather than selling their land. These expanded uses provide secondary income for agricultural operators and generally drive economic development within the surrounding area. These uses could include uses like dude ranches, short-term rentals; camping; agri-stay; special events; private land camping; increased accessory dwelling unit allowances; agricultural exemptions from some development and subdivision standards; allowances for agricultural residences for workers; and integrated alternative energy uses. Careful consideration should be given to the impact on surrounding properties when any of these expanded allowances is contemplated. For example, while special event allowances may provide additional income opportunities for agricultural operators, the impacts on roads and public infrastructure as well as the quiet enjoyment of neighboring property owners' land is a key consideration.

Implementation Strategy

The Gallatin County Growth policy includes and implementation task to develop an Agriculture Preservation Plan. Such a plan should make recommendations for expanded agricultural uses. Expanded uses for agricultural properties would be implemented through Gallatin County Zoning Regulations in the allowed uses section. The allowed uses could vary across zone districts and planning areas.

Consider findings of the City of Bozeman Local Food System Preliminary Mapping Project for strategies to better support a resilient, sustainable, and equitable local food system.

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☐ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☐ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Chaffee County special event, agritourism, and private land camping allowances | Chaffee County, CO

Land Development Code – see table 3-2-2 Use Table on page 3-17 | Teton County, ID

Current Use

No

Recommending Plan/Source

Literature Review

Bozeman Climate Plan

2.5. Improved Landscape Design and Management

Overview

The valley in the Lower Gallatin Watershed was once a paradise for fish, wildlife, and the Native Americans who traveled here to harvest foods. Over time, development has removed the rivers' natural ability to capture and treat pollutants, provide shade, regenerate aquatic habitat, give shelter to wildlife, flood, and migrate.

On-site native plants and mature trees should be preserved to the maximum extent possible. It is more cost-effective to preserve existing vegetation than to revegetate, and, once disturbed, the biological and visual integrity of a site becomes severely compromised and is complicated to restore. Native plant communities promote functional connectivity, habitat for birds and pollinator species, and wildlife movement and are well adapted to annual rainfall amounts in the region. Invasive plants prefer disturbed soils and increase fire frequency, reduce habitat quality, and out compete natives for water.

If disturbance is unavoidable, salvaging of plants, surface rock, and the upper layer of soil include boxing, mechanical spading, and bare-root transplant can preserve some resources. Boulders and other surface rock may be salvaged, and incorporated back into the restoration area to retain the natural site soil, seed bank, organic material, nutrients, and beneficial microorganisms. Noxious weed mitigation programs should encourage weed reduction measures for new developments, as well as mitigation in existing areas where noxious weeds may be transplanted.

As part of the City of Bozeman Unified Development Code Update, the City is creating landscape and irrigation performance and design standards for new construction projects. These standards will ensure that new homes built within City of Bozeman limits use water efficiently outdoors through the implementation of requirements for drought adapted landscaping, and efficiency requirements for irrigation systems. The City of Bozeman's Water Conservation Division offers incentives for planting drought tolerant plants and removing turf grass through drought tolerant plant and turf removal rebates. The City of Bozeman has also hosted educational opportunities for the community to learn about drought tolerant landscaping and native plants.

Improved landscape design and management can also be accomplished through creation of educational materials and education programs for residents.

Implementation Strategy

A requirement for preservation of native plant materials and drought tolerant landscaping are implemented through Gallatin County or City of Bozeman zoning and subdivision regulations. Native plant preservation and drought tolerant landscaping can also be incentivized through education and rebate programs like the city rebate program for removing turf.

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☑ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☑ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Bozeman, MT Landscaping Standards

Water Efficient Landscape Design & Development Standards | Salt Lake County, UT

Montana Native Plant Guidance https://mtnativeplants.org/native-plant-landscaping/

Landscaping with Native Plants in South Central Montana Handbook

Current Use

Yes, City of Bozeman

Recommending Plan/Source

County Growth Policy

2017 Gallatin Valley Hazard Mitigation Plan

2018 Climate Vulnerability and Resilience Strategy

2020 Bozeman Climate Plan

2.6. Integration of Sensitive Lands Mapping

Overview

As described throughout this Plan, agencies, partners, and landowners can use the data mapping products developed through the sensitive lands modeling effort to inform land use decisions.

For example, cities or counties could use the sensitive lands model result maps to guide future parkland acquisition and developer dedication. These maps are publicly available through the Sensitive Lands Plan Project Website. No GIS software or other tools are required to view it.

Implementation Strategy

Long-term use of the data mapping products will require maintenance to ensure the maps are kept up to date. Refer to the section below on reviewing and updating the Plan.

Implementation Methods

- ☐ Capital Improvement
- ☐ Development Code Update
- ☑ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☐ Policy/Program

Implementation Partners

- ☑ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

King County, WA | iMap

Current Use

None

Recommending Plan/Source

PRAT; Literature Review

2.7. Living with Wildlife

Overview

Increased population and expansion into wildlife habitat increases the likelihood of human-wildlife conflicts, displacement of wildlife, and human impact on sensitive lands. There are many innovative tools that can be used to promote positive co-existence between humans and wildlife. Local agencies and non-profit organizations can develop tools and resources for landowners on funding and technical assistance opportunities. Additionally, ranchers and farmers can prevent conflicts with wildlife with electric fences, carcass removal, and range riders. Examples include:

Wildlife Signage

Signage may be used to warn drivers of wildlife corridors and potential crossings areas, especially where at-grade crossings are used or in areas where wildlife crossings are known but other best management practices or mitigation measures are not implemented. Signs can be standalone roadside signs, flashing or activated signage, or even trail head signs. Encouraging drivers to reduce their speed and be aware of the potential for wildlife on roads reduces wildlife-vehicle collisions, primarily only for large mammals and big game species.

Bear-Resistant Waste Bins and Waste Collection Practices

Taking preventative measures to keep waste away from bears and other wildlife can reduce wildlife conflicts and wildlife habituation to human food and waste. The majority of conflicts occur in residential areas. Preventative measures can include encouraging or requiring residents to store waste bins in enclosed spaces like garages or sheds or implementing bear-resistant trashcans. Municipal and private waste collection services can pilot bear-resistant waste bin programs in areas that are identified as locations where bear conflicts frequently occur or are more likely to occur. Bear-resistant waste bin programs are most successful when they are implemented in an entire neighborhood or connected area, rather than scattered throughout a waste collection area. A bear buffer zone could be established to identify key areas where bear-resistant waste bins should be implemented. Other practices such has when and how to hang bird feeders will also help reduce conflict.

Education and Outreach

Local agencies and non-profits can collaborate to increase outreach and awareness about living with wildlife and low-impact practices to cultivate environmental stewardship and awareness in the community. Potential programs could include promoting sustainable trail and park use through an awareness campaign, developing guides for residents and newcomers on living with wildlife and stewardship, outreach at community events, and more. Further, local schools and youth programming can be used to promote living with wildlife and the goals for protecting sensitive lands. Getting youth engaged at a young age as stewards of the lands is a long-term investment resulting in youth interested in natural resource careers and support for various funding measures. The Interagency Grizzly Bear Committee provides info and brochures on avoiding human-bear recreation conflicts.

Implementation Methods

- ☑ Capital Improvement
- ☑ Development Code Update
- ☑ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☑ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☑ State/Federal Agencies

Examples and Case Studies

US Department of Transportation State DOT Wildlife Crossing Structures: Northwest / Western States

City of Edmonton, Canada Wildlife Passage Engineering Design Guidelines

Interagency Grizzly Bear Committee

Current Use

Yes - As needed

Recommending Plan/Source

County Growth Policy; Bozeman Comprehensive Plan EPO 1.5 and EPO 2.3

2.8. Park/Open Space Dedications and Cash-in-lieu

Overview

Park and open space impact and mitigation fees are used to mitigate impacts on identified community assets and public amenities or to help pay for new or expanded public facilities. Impact fees are one-time fees assessed at the time of building or physical development permit submission. Open space dedication requirements are common practice across Montana and other western communities to ensure that new development pays for its impact and use of public facilities.

The Montana Subdivision and Platting Act and the Montana Land Use Planning Act require local governments to adopt standards for mitigation of recreational impact by development. There are both minimum and maximum requirements. Due to the wide range of circumstances across the state there are many methods to meet park dedication requirements. Protection of habitat can be one element in considering whether or not to accept proposed mitigation.

When a local government finds it most appropriate, a fee-in-lieu of dedication of land can be accepted. The fees can be used for a variety of public uses including developing new facilities or upgrades to existing facilities, but they must be spent to the benefit of the residents of the development which paid the fee. Due to restrictions in determined fee values the amount of money paid is a small fraction of the actual cost of land acquisition. Land dedicated or acquired by local governments becomes assets of the local government and an on-going maintenance responsibility with budgetary impacts.

Development of dedication requirements and fee-in lieu options require a careful study of the impact each new type of development, whether it be commercial, residential, industrial, or mixed-use has on existing facilities. This impact fee study is community-specific and should be updated regularly.

The City of Bozeman's PRAT Plan recommends allowing watercourse setbacks, wetlands, and other priority conservation lands and similar acreage to contribute to dedication requirements in new developments if the project also includes community benefit improvements.

Implementation Strategy

Open space dedications and fees in-lieu are developed utilizing an impact fee study specific to the community and are often codified or adopted by the local government as a requirement for all new development.

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☑ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Blaine County, ID - wildlife overlay district, wetland overlay district, agricultural district

Conservation Tools Agricultural Overlay Zoning Overview

Current Use

Minimal

Recommending Plan/Source

County Growth Policy, Bozeman Development Code Division 38.420; PRAT Plan, 2020 Bozeman Community Plan

2.9. Wildlife Friendly Trails

Overview

Trail projects provide opportunities to improve connectivity through sensitive habitat and wildlife crossings areas to reduce impacts of edge disturbances and enhance existing crossing opportunities. Trail and recreation amenities can be used to buffer sensitive habitats, improving connectivity and encouraging wildlife crossing at safe locations. Recreational trails along the wildland-urban interface (areas where development abuts undeveloped areas) provide public greenway access while minimizing the adverse effects of this access on sensitive biological resources. Trail corridors naturally integrate well through floodplains; however, increasing the separation between the trail and floodplain both protects the trail from future maintenance and post-flood reconstruction and allows for additional buffer space for wildlife movement corridors. Trail easements can include additional buffer widths. Trail crossings of arterial roads should not overlap with wildlife crossings; separate crossings should be provided to minimize disturbance.

In addition to trail buffers, thought should be given to the placement to other recreational amenities within a development. For example, locating a dog park in the interior of a development or limiting off-leash dog areas to interior lots would help minimize wildlife conflicts with dogs.

Recreational amenities may also be accommodated in multi-purpose corridors. A multi-purpose corridor is a design element that integrates multiple utility functions with wildlife corridors to provide both human and wildlife benefits such as protection of environmental values and supporting wildlife habitats, floodplain management, recreation opportunities, and consolidated infrastructure corridors. For example, co-location of wildlife-friendly flood improvements along wetland and riparian areas provide for wider wildlife corridors that are more amenable to wildlife passage and provide greater buffers from development.

Further, development of wildlife mitigation features could allow for the width of the corridor to be reduced as the benefits for wildlife are increased - if there is appropriate habitat with no visibility of man-made structures. Wider multi-purpose corridors with co-located utilities, paths, and open space provide for wildlife habitat and flood water conveyance while providing less reliance on structural flood mitigation measures and their associate maintenance costs. Development of key infrastructure components and improvements can also encourage development to occur in desired places because infrastructure is already readily available.

Implementation Strategy

The location of trails and amenities are generally identified in a community parks and trails master plan or comprehensive plan and distances of the setbacks and buffers or requirements for co-location and development of multi-purpose corridors could be implemented in Gallatin County Zoning Regulations. GVLT and other organizations have also worked to implement trails within conservation easements to provide multiple benefits.

Implementation Methods

- ☐ Capital Improvement
- ☐ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☐ State/Federal Agencies

Examples and Case Studies

Arizona Game and Fish Department Wildlife Friendly Guidelines

Colorado's Trails with Wildlife in Mind Handbook

Current Use

None

Recommending Plan/Source

Literature Review

2.10. Wildland Urban Interface Designation

Overview

Reducing fuels in the wildland-urban interface has been proven to prevent mega-fires and their detrimental impacts to water quality. As development continues to push deeper into forested and other wildfire prone areas, the risk of wildfire. As a result, many communities have adopted wildland urban interface (WUI) standards to mitigate the risk of wildfire and protect private property. The WUI is defined as areas where homes are built near or among lands prone to wildland fire. WUI standards generally include a subdivision review process to review wildfire risk and mitigate impact on forest resources, as well as fire suppression infrastructure, fuels mitigation, and defensible space measures. The state both authorizes and limits local government authority over WUI mitigation measures.

Under Montana Code 76-13-145, communities may designate WUI parcels, delineate those parcels on maps, and ensure that the maps and information on the maps are available to the public, local governing bodies, and governmental fire agencies. Local governments may not prohibit development solely because it is in a WUI. By designing a WUI in a way that allows for habitat to be maintained, and for animals to cross through private property WUI can be an important habitat area, but there is a need to practice wildlife-safe practices in the WUI such as storing food in bear-safe garbage containers. Many communities adopt a community wildfire protection plan (CWPP) prior to designating a WUI, but it is not required. Gallatin County has adopted a CWPP.

The Montana DNRC also provides funding for wildfire mitigation efforts through the Wildland Urban Interface Grants Program. To qualify for funding, projects must either reduce hazardous fuels in the WUI, provide WUI-based prevention and education, and or community Wildfire Protection Plan (CWPP) development or updates. Gallatin County emergency response has landowner assistance programs and staff to support WUI efforts.

Implementation Strategy

Designation and mapping of the WUI occurs through the development of a CWPP for a local government or region. Following adoption of the CWPP, WUI development standards are often developed and incorporated into the development code to mitigate risk of loss of life and property and to protect local biodiversity and mitigate impacts to water quality. Gallatin County has adopted a CWPP but has not developed WUI standards in their land development regulations. The 2021 International Building Code does include WUI building construction standards. If a local jurisdiction has adopted the building codes authorized by the state they may apply these standards. Gallatin County does not currently administer or enforce building codes, which are administered and enforced by the State Department of Labor and Industry in County areas. The Central Valley Fire District administers and enforces fire code within their District. Additionally, Gallatin Emergency Management and fire districts have done extensive outreach and education with property owners -- programs that should be replicated by other agencies as well.

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☐ Non-profits/Land Trusts
- ☑ State/Federal Agencies

Examples and Case Studies

Montana Code | Designation Of Wildland-Urban Interface Parcels

Montana DNRC | Wildland Urban Interface Grants

Current Use

Partially – Gallatin County has adopted a Community Wildfire Protection Plan

Recommending Plan/Source

County Growth Policy

2.11. Wildlife-Friendly Fencing

Overview

Fencing can be a significant barrier to wildlife connectivity and movement and may impede the ability of wildlife to move between habitat areas. Movement between habitat areas is necessary for wildlife to access food, water, shelter, and potential mates. Many traditional fences are either too high for wildlife to jump over, or contain barbs, spikes, or razor wire that can fatally injure animals. Traditional fencing methods may be also be hard for low-flying birds to spot, which can cause birds to collide with fencing. In most cases, fencing and walls should be reduced between lots, keeping fencing closer to the structures whenever possible. The type and design of the fencing will be vital to the functionality with regards to permeability of wildlife. Permeable fencing, or wildlife-friendly fencing, is fencing that allows for the safe passage of animals. Wildlife-friendly fencing is not practical in all applications but is appropriate to use when the desire is to facilitate wildlife movement through existing or constructed wildlife corridors.

In some situations, the purpose of constructing fencing or walls may be to exclude wildlife such as barns and animal-keeping areas. If not, natural barriers or designs using natural materials (e.g., boulders, densely planted vegetation, riprap), may be more effective than a fence at preventing access or providing privacy. These options can result in a more "natural" appearance of the fence or wall and may also reduce maintenance requirements. Fencing, walls, and other barriers can be used to restrict access to road rights-of-way, as well as to funnel wildlife to habitat areas or crossing structures such as bridges and culverts. Decorative fencing should not contain features that can be hazardous to wildlife such as pointed or narrow post caps, wires that may entangle animals, and hollow fence posts that are open at the top where birds or other small animals may become entrapped in an open cavity.

Implementation Strategy

Wildlife fencing can be implemented through zoning and subdivision regulations. The subdivision and zoning regulations can require wildlife-friendly fencing in high value wildlife habitat, migration corridors, or other movement corridors.

Implementation Methods

- ☐ Capital Improvement
- ☑ Development Code Update
- ☑ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☑ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☑ State/Federal Agencies

Examples and Case Studies

Montana FWP A Landowners Guide to Wildlife Friendly Fencing

MDOT | Wildlife Friendly Fence: A Guide to Landowner and Wildlife Needs

Teton County, WY | Wildlife Friendly Fencing Regulations (Section 5.1.2, page 201-205 of the pdf)

Current Use

Yes – as needed

Recommending Plan/Source

Literature Review

2.12. Wildlife Crossings

Overview

Wildlife-vehicle collisions on major roadways are a primary contributor to animal mortality in the region. Constructing roadway crossings that provide for wildlife movement is one of the most effective methods of reducing wildlife-vehicle collisions, and maintaining healthy and connected wildlife habitat. Wildlife crossings can be overpasses or underpasses depending on the target species and surrounding topography. Crossings can also be designed either in conjunction with, or separate from, other drainage crossings. Crossing structures should be located adjacent/within to key habitat linkages to support wildlife movement at an ecosystem level.

Floodplains and riparian areas are natural movement corridors for wildlife, so it may be desirable to co-locate drainage and wildlife crossing structures in many riparian areas. Culverts of various designs and materials, such as concrete box culverts and corrugated metal pipes, are frequently used to facilitate wildlife movements under roadways and developed areas. Dedicated overpass structures may also be used to assist wildlife passage over large roadways but are more costly. Overpasses may be more effective in situations where topography doesn't lend itself to the construction of underpasses or where roadways are already constructed. Most species prefer crossing structures that are three-sided (e.g., bridges), arched, or buried so that there is a natural substrate on the bottom. Incorporating vegetation into the wildlife crossing design and limiting vegetation removal around crossings can increase their use by wildlife. Steep slopes that lead into or out of a crossing should be avoided to allow for a clear view through a crossing to the other side. The Montana Department of Transportation (MDT) references the US Department of Transportation wildlife crossing best practices manual. Additionally, the US Forest Service has developed a wildlife crossings manual that is specific to the mountain west. Wildlife barrier fencing or rip-rap parallel with the roadway should be used to guide wildlife towards a desired crossing structures

Implementation Strategy

Wildlife crossings are implemented through capital improvement plans as capital expenditures. Several federal, state, and private funding streams are available including the 2021 Infrastructure Investment and Jobs Act Wildlife Crossing Pilot Program which pledges $350 million in grants toward wildlife crossings. Current state bills are working to establish a fund to support MDT and local governments to leverage federal infrastructure funding dedicated to wildlife crossings. However, a study of the highest wildlife-vehicle collision areas and key habitat linkages should be performed to ensure that crossings are appropriately located. Many local studies have already been completed, including:

- Bozeman Pass Wildlife Linkage and Channelization and Highway Safety Studies | MDT
- Center for Large Landscape Conservation | US-191 Wildlife & Transportation Assessment

Implementation Methods

- ☑ Capital Improvement
- ☐ Development Code Update
- ☐ Education
- ☐ Funding Opportunity
- ☐ Incentive
- ☐ Legislative Initiative
- ☑ Policy/Program

Implementation Partners

- ☐ Individual Property Owners
- ☑ County
- ☑ Municipalities
- ☑ Non-profits/Land Trusts
- ☑ State/Federal Agencies

Examples and Case Studies

Wildlife- Vehicle Collision and Crossing Mitigation Measures: A Toolbox for the Montana Department of Transportation

Center for Large Landscape Conservation | Land Trusts and Wildlife Crossing Structures Toolkit

Teton County, WY Wildlife Crossings Master Plan t

US DOT | Wildlife Crossings Program

Current Use

Yes; Bear Canyon and I-90 Underpasses

Recommending Plan/Source

County Growth Policy; Bozeman Comprehensive Plan EPO 1.5 and EPO 2.3

3. Tier 3 Recommendations

3.1. Controlled Groundwater Area (CGWA)

Under Montana State Statute, the Montana Department of Natural Resources and Conservation (DNRC) has the authority to control or close river basins and groundwater aquifers due to concerns regarding water availability, water contamination, and protecting existing water rights. Controls and closures come in five categories, with the lowest tire being a Controlled Groundwater Area (CGWA) designation. A CGWA designation can be implemented directly from Montana DNRC, by petition from any state or local agency, or by water users on the source. According to Montana DNRC guidance, designation of CGWAs are generally because "groundwater withdrawals in the area are greater than recharge of the aquifer, excessive groundwater withdrawals are likely to occur in the near future, there are significant disputes regarding groundwater rights in the area, groundwater levels or pressures in the area have been or are declining excessively, excessive groundwater withdrawals would cause contaminant migration, groundwater withdrawals are or will adversely affect groundwater quality, and/or water quality in the groundwater area is not suited for a specific beneficial use," Within CGWA, anyone wishing to drill any size or type of well must first obtain a Permit for Beneficial Water Use (85-2-508, MCA).

Gallatin County has multiple existing CGWA designations. The Bozeman Solvent Site Controlled Groundwater Area, located in the northwestern portion of the City of Bozeman and spreading north into the unincorporated County, was designated in 1998 due to groundwater contamination concerns. The Idaho Pole Company Site Controlled Groundwater Area is located along the eastern edge of the City of Bozeman and was designated in 2001 due to contamination of the basin. CGWA designations are determined by DNRC in conjunction with local governments. For more information visit:

Montana DNRC | Controlled Groundwater Areas Home

Montana DNRC | Montana Basin Closures and Controlled Ground Water Areas

3.2. Maximum Size of Single Structure/Dwelling Unit

Generally, the maximum size of an individual structure is regulated through maximum floor area ratio (FAR) allowances in the zoning regulations. FAR is the percentage or area of a lot which may be covered by a structure. FAR restrictions are often paired with minimum setbacks, maximum height, and maximum number of stories per structure standards. Some communities implement maximum square footage allowances for individual structures in addition to FAR restrictions in areas of environmental concern, especially where FAR allowances are not restrictive or would result in a large amount of development. The maximum size of a dwelling unit or structure can differ between zone districts or can be the same across all zones.

Limiting the maximum allowed dwelling unit or structure size can be impactful in reducing the amount of development occurring in sensitive areas and reducing overall housing costs. It has been shown that large buildings may deter use of wildlife corridors or habitat areas by some wildlife species. However, limiting the maximum size of a single structure can lead to multiple smaller structures, rather than a larger single structure if the size limit is too restrictive. It is important to consider the average size of a use when considering maximum size limitations. Maximum house and structure sizes can be used alone, or in conjunction with other best management practice tools like cluster development. The limitations on the size of structures are detailed in Gallatin County zoning regulations. For more information visit:

Sustainable City Code | Maximum Scale of Single-Family Residence

Teton County, WY Maximum Scale of Residential Structures

Teton County, WY Maximum Scale of Residential Structures

Implementation

Regional Partnerships

The collaborative efforts between agencies, non-governmental organizations (NGOs), and communities form the backbone of our ability to execute these recommendations effectively. There are many NGOs and partnerships, including the many members of the Working Group that contributed to this process, within the Gallatin Valley working on protecting sensitive lands. During implementation, many recommendations would benefit from interlocal agreements or memoranda of understanding to further define the use and scope of each jurisdiction. Many of these partnerships are described in the various recommendations, however, a few that have not been included previously are described here.

Local Water Quality Districts

In 1991, the Montana Legislature passed a law giving local governments the authority to form local water quality districts. The Gallatin Local Water Quality District (GLWQD) has with the mission "To protect, preserve, and improve the quality of groundwater and surface water within the District." The GLWQD has three focus areas: education and outreach to improve public awareness and understanding of local water quality, water resources, and GLWQD projects; collection, analysis, and monitoring of water data that evaluate water quality; and compiling, storing, and distribution of water quality data and information. The GLWQD is a non-regulatory entity and does not administer or enforce any City or County ordinances, rules, or regulations, pertaining to water quality but may be involved in teh development of revised Codes and review of applications. According to the Administrative Rules of Montana, which govern the formation and operation of local water quality districts (ARM 17.30.1807), the Montana Department of Environmental Quality may request a district enforce provisions of the Montana Water Quality Act (MCA 75-5-605), for particular violations.The role of the GLWQD is in partnering with local governments to continue to raise awareness of water quality issues and develop educational materials.

Land Trusts

One necessary step in permanent sensitive area protection is a targeted effort aimed at land acquisition, conservation easements, and development restrictions of constrained or sensitive lands. This has been proven as one of the most effective tools across the western US. Land trusts are a specific type of 501(c)3 nonprofit that typically holds contracts for conservation easements to preserve open space or agricultural land. They can also receive land donations or other forms of donations. Whether held in private or public ownership, their role is to continue to monitor the habitat quality and resources for which the land is conserved. Land trusts also generally serve as educators, providing the public with educational opportunities and events to learn about conserved lands and their benefits. As grants are acquired, or other funds are directed at land protection, land stewards will be necessary to maintain our new permanent open space. Montana Land Trusts have a strong history of partnering with both landowners and local governments to achieve conservation goals.

- Gallatin Valley Land Trust
- Montana Land Reliance
- The Trust for Public
- Montana Association of Land Trusts
- American Farmland Trust

State Trust Lands

Regarding Trust Land Management, the Montana Department of Natural Resource & Conservation (DNRC) manages its properties for the highest and best use while protecting the long-term income generating capacity of these lands. DNRC continues to work with the City of Bozeman and Gallatin County to restore forest health, reduce wildfire risk, and provide wildfire protection services. The Study Area contains 41,698 acres of State Trust Lands surface acreage (35,127 acres of classified agriculture/grazing and 5,776 acres of classified forest), and 73,954 acres of subsurface mineral rights. In addition to the Trust Lands, 51,216 acres of Montana Forest Action Plan priority areas have been identified of which 22,823 acres considered in poor forest health and / or elevated fire risk.

Tribal Partnerships

In addition to developing and publicizing land acknowledgments in consultation with Indigenous partners, Gallatin County and the incorporated cities and towns within the county should work to involve Tribes and Native Nations in various ways through all planning and implementation decisions. The first step to develop Tribal partnerships should be to have honest and ethical conversations where Indigenous Nations lead the process in terms of how they want to engage with other partners, planning processes, and implementation, as well as how their Traditional Ecological Knowledge can be appropriately and respectful integrated into land management while asserting their data sovereignty. The First Nations Information Governance Centre offers training and resources for integrating Traditional Ecological Knowledge. For example, going beyond land acknowledgments, cities and counties should designate seats on advisory boards for Tribal members; interpret past, present, and future ways of Indigenous life with tribal consultation; integrate Traditional Ecological Knowledge into land management; consider adoption of United Nations Declarations on the Rights of Indigenous Peoples (UNDRIP). While several Indigenous contributors were consulted on this project, we recognize that not all tribes whose traditional territory we are on were consulted in the development of this plan.

Funding Mechanisms

Funding mechanisms are ever changing and new sources emerge as state and federal legislative priorities change. A few are provided here for reference, however, this is by no means comprehensive.

Grant Programs

There are several grant and partnership programs that currently exist to provide funding and/or assistance for protecting, enhancing, and restoring sensitive lands. Grant programs change and evolve year to year, interested parties should reference the program for the latest application and process requirements.

NRCS | Programs and Initiatives

The Natural Resources Conservation Service (NRCS) is an agency within the US Department of Agriculture. The NRCS works with producers, soil and water conservation districts, and other partners to protect and conserve natural resources on private lands throughout the United States. The NRCS administers a number of programs, grants, and initiatives available to support a variety of sensitive land protections.

Environmental Quality Incentives Program (EQIP)

The Environmental Quality Incentives Program (EQIP) is NRCS' flagship conservation program that provides technical and financial assistance to agricultural producers and forest landowners to address natural resource concerns including water quantity and quality, air quality, improved soil health, drought resilience, and soil and erosion control. Through the EQIP program, NRCS works directly with farmers to develop a conservation plan that outlines conservation practices and activities to help solve on-farm resource issues.

Landscape Conservation Initiatives is an EQIP program that enhances local conservation actions and processes to better address nationally and regionally important conservation goals that transcend localities. Landscape conservation initiatives seek to amplify outreach and education efforts through scientific and technical assistance. In Montana these initiatives have been focused primarily on simplifying the Greater Sage Grouse Initiative efforts.

Conservation Innovation Grants (CIG)

Conservation Innovation Grants (CIG) is a competitive program that supports the development of new tools, approaches, practices, and technologies to further natural resource conservation on private lands at the national, state, and on-farm levels.

Regional Conservation Partnership Program (RCPP)

The Regional Conservation Partnership Program (RCPP) is a voluntary approach to conservation that expands the reach of conservation efforts and climate-smart agriculture through public-private partnerships. RCPP projects fall under two different categories: RCPP Classic projects which are implemented using NRCS contracts and easements in collaboration with project partners, and RCPP Grants where the lead partner works directly with agricultural producers to support the development of new conservation structures and approaches. Up to $500 million in funding is available for fiscal year 2023 due to the Inflation Reduction Act.

Conservation Stewardship Program (CSP)

Similar to Landscape Conservation Initiatives, the Conservation Stewardship Program (CSP) helps amplify existing conservation efforts by working with landowners to develop a conservation plan that outlines and enhances existing efforts, using new conservation practices or activities. In exchange for increased conservation efforts, the CSP provides annual payments for each enhanced conservation effort.

Watershed Protection and Flood Prevention (WFPO) Program

The WFPO program provides technical and financial assistance to government entities to help plan and implement watershed projects which provide flood prevention measures, watershed protection, public recreation opportunities, public fish and wildlife habitat, agricultural water management standards, municipal and industrial water supply needs, and/or water quality management. Watershed conservation projects are planned and implemented jointly by a local, state, and federal agency with the support of landowners and residents in the watershed.

Healthy Forests Reserve Program (HFRP)

The purpose of the Healthy Forests Reserve Program (HFRP) is to promote the recovery of endangered and threatened species under the Endangered Species Act (ESA); improve plant and animal biodiversity; and enhance carbon sequestration through easements, 30-year contracts and 10-year cost-share agreements. The HFRP was signed into law as part of the Healthy Forests Restoration Act of 2003 and has been amended in subsequent Farm Bills to broaden the scope of the program.

Agricultural Conservation Easement Program (ACEP)

The Agricultural Conservation Easement Program (ACEP) is a conservation easement program which seeks to protect the agricultural viability and related conservation values; protect grazing uses and related conservation values; and protect, restore, and enhance wetlands on eligible land. The ACEP has two components:

Agricultural Land Easements

NRCS provides financial assistance to partners for purchasing Agricultural Land Easements that protect the agricultural use and conservation values of land. Under this program, NRCS may contribute up to 50 percent of the fair market value of the agricultural land easement.

Wetlands Reserve Easements (WRE) and Wetland Reserve Enhancement Partnership (WREP)

The Wetland Reserve Enhancement Partnership (WREP) is part of the Wetland Reserve Easement (WRE) component of the Agricultural Conservation Easement Program (ACEP). The WREP allows state agencies, county and local governments, non-governmental organizations and American Indian tribes to submit proposals for priority wetland restoration and enhancement projects to collaborate with NRCS to purchase NRCS Wetland Reserve Easements. Easements may be purchased for permanent protection or for 30-year easements and are available for a variety of wetland restoration and enhancement efforts including farmed or converted wetlands. In both cases, the NRCS will develop and implement a restoration plan to restore, protect, and enhance the wetland's functions and values.

Conservation Reserve Program (CRP)

The Conservation Reserve Program (CRP) provides a yearly rental payment to farmers who remove environmentally sensitive land from agricultural production and plant species that will improve environmental health and quality. The CRP is administered through the USDA Farm Service Agency with the NRCS providing technical assistance to landowners. CRP contracts range from 10–15-year contracts with the primary goal of the program being to re-establish valuable land cover to help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat.

National Water Quality Initiative (NWQI)

National Water Quality Initiative (NWQI) is a partnership between the NRCS, state water quality agencies, and the U.S. EPA to identify and address impaired water bodies through voluntary conservation. NRCS provides targeted funding for financial and technical assistance in small watersheds where farmers can use conservation practices to make a difference. State water quality agencies and other partners contribute additional resources for watershed planning, implementation, and outreach, as well as monitoring efforts to track water quality. In 2019, the scope of the NWQI was expanded to include source water protections for both surface and ground water public water systems. Since the program went into effect in 2012, over 5,600 producers have chosen to adopt conservation practices on more than 1,190,000 acres in priority watersheds through NWQI. Additionally, over 16 impaired water bodies have been improved and subsequently scheduled for de-listing through the NWQI.

Source Water Protection

Source water protection includes a variety of initiatives and actions aimed at protecting, maintaining, or improving water quality and quantity of drinking water. NRCS source water protection funding is through the 2018 Farm Bill, which added a provision providing for the protection of source water through targeted conservation practices.

Working Lands for Wildlife (WLFW)

The Working Lands for Wildlife (WLFW) is an innovative approach to allowing continued operation of agricultural lands even in the presence of endangered species. Using funding from the Farm Bill, the NRCS provides technical and financial assistance to landowners who voluntarily make improvements to their working lands, while the US Fish and Wildlife Service provides landowners with regulatory predictability for the Endangered Species Act when needed. As of 2022, the WLWF program has proven wildly successful with more than 8,400 participants and nearly 12 million acres of wildlife habitat conserved since 2010. WLWF efforts in Montana have focused primarily on greater sage grouse initiative, which also offers technical and financial assistance to specifically help ranchers voluntarily conserve sage grouse habitat on private lands.

Montana Snow Survey and Water Supply Forecasting Program

NRCS Montana Snow Survey Program provides mountain snowpack and precipitation data via manual snowpack measurements and the Snowpack Telemetry network to forecast annual runoff that will occur when snow melts. Individuals, organizations, and state and federal agencies use the data collected from this program to make decisions relating to agricultural production, fish and wildlife management, municipal and industrial water supply, urban development, flood control, recreation, power generation, and water quality management.

Water Pollution Control State Revolving Fund (WPCSRF) and Drinking Water State Revolving Fund

The Montana Legislature established the Water Pollution Control State Revolving Fund (WPCSRF) Loan Program for water pollution control projects administered through the Montana DEQ and provides at or below market interest rate loans to eligible Montana entities. Eligible projects include wastewater treatment plant improvements, interceptors, collectors, lift stations, agricultural best management practices, animal feeding operations, wetland and streambank restoration, underground storage tanks, and urban storm water runoff mitigation efforts, among others.

The Drinking Water State Revolving Fund program is also administered through the Montana DEQ and provides at or below market interest rate loans to eligible Montana entities, but as federal-state partnerships to help ensure safe drinking water.

Entities must apply to have their project added to the Priority List within Montana DEQ. Loans will be offered on a first-come basis until the demand exceed the available funds. Lower ranked projects may be funded before higher ranked projects (if the higher ranked project is not ready to proceed) as long as the funds are available. Ranking on the priority list is based on water quality and/or public health impacts and financial needs.

Habitat Conservation Lease Program

The Habitat Conservation Lease Program is a pilot conservation program administered by the Montana Fish, Wildlife, and Parks Department to supplement existing conservation and land purchase programs. The habitat conservation lease is a voluntary, incentive-based agreement between private property owners and Montana Fish, Wildlife, and Parks Department in which the landowner commits to specific land management practices that protect priority wildlife habitat and Montana Fish, Wildlife, and Parks Department pays landowners a one-time per-acre fee for the lease. Agreements are anticipated to have a term of 30 and 40 years. The initial focus of the pilot program will be for prairie habitats, with a priority on sage-grouse core areas and other identified as high priority plains habitats. It is anticipated that the focus will be expanded to other priority habitats in subsequent years. Applications for the pilot program closed in September of 2022 and comments on the Draft Supplemental Environmental Assessment were open through May 1, 2023.

Land & Water Conservation Fund Recreation Grants

The Land & Water Conservation Fund Act of 1965 established the Land & Water Conservation Fund as a federal grant program to fund outdoor recreation projects in accordance with a Statewide Comprehensive Outdoor Recreation Plans (SCORP). The Land & Water Conservation Fund specifically provides funding for acquisition and development of public outdoor recreation areas and facilities, as well as planning grants are also available to assist states in developing a SCORP. Examples of recently funded projects within Gallatin County include the Gallatin County Regional Park, Bozeman Municipal Park (Bogert Park), Manhattan Taylor Park, Bozeman Sundance Springs Park, Three Forks Headwaters Trail System, and numerous other park and field renovations, land acquisitions, trail enhancements, and outdoor swimming pools. See the grant manual here.

Wildlife Habitat Improvement Program Grants

The Wildlife Habitat Improvement Program Grants are administered by the Montana Fish, Wildlife, and Parks Department, as enabled by the Montana Wildlife Habitat Improvement Act passed into law in 2017. This program provides up to $2 million annually in federal funding to restore priority wildlife habitats by managing noxious weeds. According to the program website, the priorities for funding are landscape-scale projects lands that are open to public hunting and involve priority wildlife habitats; noxious weed infestations that directly impact habitat functions; broad partnerships involving multiple landowners; proposals with leveraging beyond the minimum match funding requirement; projects that retain or restore native plant communities.

Infrastructure Investment and Jobs Act (IIJA)Wildlife Crossing Pilot Program

IIJA became law in November 2021, infusing billions of dollars into federal grant programs to improve wildlife crossing infrastructure, reduce wildlife-vehicle collisions, and mitigate habitat fragmentation resulting from transportation infrastructure. Funds must be obligated over 5 years The US Department of Transportation and Federal Highway Administration administer these funds mostly through existing programs, either by competitive grant giving or formula-based allocations for states to self-administer.

Donations and Philanthropy

Donations of land where sensitive resources existing by willing landowners could be accepted. Philanthropy through volunteers, funding, or other means is a great way to match grant programs. Friends of groups or foundation are formed to raise money typically for a single focus purpose that will benefit the community as a whole and their special interest. Friends' groups strengthen community support and value for specific interests or facilities, and leverage the work of others through stewardship, volunteer hours, fundraising, and advocacy.

New Types of Funding Sources

Grants and partnerships can be unpredictable. Implementing protections to sensitive lands will take multiple tools. The following is a brief list of potential new recommendations that were identified during the planning process. However, additional new funding mechanism are always emerging.

Gallatin County Innovative Agriculture Grant/Loan Program

Supports local farmers and ranchers to implement conservation best management practices, build a local processing facility, purchase harvesting equipment for innovative crop production, greenhouses, etc. This could be modeled from, and be a companion program to, the NRCS Conservation Innovation Grant Program, which requires a 1:1 non-federal match.

Gallatin County Irrigation Infrastructure Grant/Loan Program

Supports off-farm irrigation infrastructure maintenance and upgrades. The canal network is critical to sustaining farming and ranching in the Gallatin Valley. The stewardship of this infrastructure has environmental implications as well, including fish passage, aquifer recharge, and water quality. The allocation of County ARPA money for irrigation projects is a huge success and could be the model for a more sustained program.

Recreation Fees

Support for improvements, maintenance, and management at local recreation sites. If lands are acquired for open space or habitat protection, they may allow passive recreation opportunities. Requiring a fee would allow to continue long-term stewardship of the property Implemented through a new department through the County or other partner.

Tourism/Sales Tax

Similar to other taxes, some communities have utilized revenue from additional sales taxes to fund parks, trails, and open space conservation efforts. The tax could be specific to certain types of businesses that are tourism oriented, such as small surcharge imposed on the cost of airline tickets, rental cars, motel rooms, outfitters and guides, guest ranch stays, or outdoor gear. Across the US, counties have also passed similar taxes, which include a share back program to municipalities. Some Idaho cities have a local sales tax, which are sometimes also referred to as local "option" taxes because the taxes are decided by the voters in the community affected. Some, but not all, choose to limit the local sales tax to lodging, alcohol by the drink, and restaurant food. To be implemented this would require the Montana State Legislature granting residents the ability to go to the polls and approve a tourist tax.

Case Studies

City of Colorado Springs, CO | Trails, Open Space, and Parks Tax

City of McCall, ID | Local Option Tax Commission

Adams County, CO | Open Space Sales Tax

City of Fort Collins, CO | Natural Areas

A Living Plan

This section identifies indicators and outlines steps for reviewing and updating the plan. This Plan will be living, allowing it to adapt to changes. Annual monitoring enables the ability to react to undesirable development changes more quickly than has been done in the past. Through adaptive management, agencies, and partners can respond to changes in development and environmental conditions, as well as respond to climate change which may change where and what lands are more sensitive.

There is no single solution to achieving the vision of the Gallatin Valley Sensitive Lands Protection Plan. Partnerships and collaboration are the foundation of the Plan's success.

Indicators

Indicators are metrics that will be used to track progress to achieve the desired future condition. Multiple recommendations and partnerships can lead to the desired change in the indicator baseline. The desired trend provides a structure to continuously verify the community's path and correct course when necessary, noting that it may be beneficial to use averages over two or three years.

Indicators are currently being gathered by Montana State Library, Montana Natural Heritage Program, MT Department of Revenue and Gallatin County. These indicators were chosen based on the sensitive lands values described throughout this Plan. They are efficient for reporting as they are accurate, reproducible, obtainable, and affordable.

The biodiversity improvements indicator is calculated with "Research Grade" data from iNaturalist, which provides observational data generated by citizen scientists. Observations with enough details can be verified by community consensus to "Research Grade." Of the 16,082 different species reported in the Study Area through iNaturalist, about 90% are native species.

In addition to the iNaturalist unique species count, an annual discussion with MFWP about biodiversity trends suggested by their field work observations and data would increase clarity on how Plan implementation may be influencing wildlife.

Indicator	Source	Baseline within study area	Desired Trend
Total Acres Conserved (Conservation Easements)	Gallatin County	164,407 Acres (within study area); 142,431 Acres (within Gallatin County	Increase
Total Acres Conserved (Managed Areas)	MNHP	349,421 Acres	Increase
Acres Conserved of High Priority Areas by Theme	See Appendix C	Wildlife and Biodiversity: 2,268 Acres Agricultural Heritage: 1,344 Acres Water Quality and Quantity: 849 Acres	Increase
Lands remaining in agricultural (regardless if they are conserved)	MT Dept. of Revenue	197,196 Acres	Maintain
Biodiversity Improvements	iNaturalist	16,082 Unique Species Observed	Increase

Reviewing and Updating this Plan

Future monitoring of this plan, including data collection and updated model outputs, will be needed.

Updating GIS Data and the Models

The GIS data that was used in the development of the sensitive lands models is constantly changing, which presents a large task to ensure future updates are made in a timely manner. Data managers and partners will need to strike a balance of providing updated models to inform decision making with the level of effort needed to maintain the data. As described previously, the GIS data presented in this Plan is not to be used as a legal document or survey instrument and is only as accurate as the data provided as inputs to the models.

On an annual basis, prior to completing the Indicator Reports and Work Plans described below, data updates should be integrated into the model. The City of Bozeman will maintain the Modeling Tool and website through their ArcGIS Online organization account. Annually, the City of Bozeman should complete a data call from each source to identify updated layers. Long-term agreements with data input providers may be necessary. If new data is available, the City of Bozeman will update the data on ArcGIS Online and rerun the models. Ultimately, the authority and responsibility to update individual data sources remains with the authoritative source (as identified in Appendix C) and the City of Bozeman will not be required to update or request updated data. Neither will the City of Bozeman distribute or make these individual layers downloadable, which can be requested from the authoritative source. Metadata will be maintained within each GIS layer to show when the data was last updated and provide a link back to the original data so the most accurate and updated data can be obtained. Outputs will be reposted to the Modeling Tool site.

Indicator Reports

A brief annual indicator report should be completed by the City of Bozeman, Gallatin County, Working Group and/or a future sensitive lands committee and placed on the City's Sensitive Lands Plan website so the public can stay informed on the state of sensitive lands. Alternatively, a dashboard could be built on the website, providing quick access to information and links to other online data. Annual indicator reports should be designed to evaluate the community's progress toward achieving the vision. These annual snapshots should be summarized and presented to other technical working groups and forums. Through these yearly indicator reports, the community will understand how we are measuring up and will have the information needed to proactively input into annual work plans. Partners should meet when indicators are not trending in the desired future condition to determine a complete and practical approach forward.

HIGH QUALITY DATA

Modeling sensitive lands and implementing recommendations based off the mapping is only as good as the data input. Continuing to invest in data management and updates is the responsibility of the authoritative data source.

Work Plans

Agencies and partners should integrate applicable recommendations into their yearly work plans as part of their budgeting process. In setting work plans, partners can meet to evaluate the work completed over the past year, review annual indicators, and prioritize recommendations for different roles. As recommendations are implemented and/or new best practices, technology, and information become available, the work plan may include recommendations that are not listed. However, every task in the work plan should be relevant to the Plan's vision, effective in addressing the four themes, and gather community input on sensitive land concerns.

Plan Update

Even if indicators are trending in the desired condition, the Plan should be reviewed and updated at least every five years with the Working Group, data stewards, partners, and the public. A more extensive public process during this review should ensure the Plan always meets the vision of the Gallatin Valley. Regular, informed, and focused updates to the Plan will allow the community to affirm its values and identify new implementation strategies. The five-year update should be a community effort built on the lessons learned through 5 years of annual indicator reports.

Appendices

Appendix A: Literature, Policy, and Case Study Review

GALLATIN VALLEY SENSITIVE LANDS PROTECTION PLAN

Connecting our Landscape, Heritage, and Future on Common Ground

LITERATURE, POLICY, AND CASE STUDY REVIEW DRAFT JANUARY 2023

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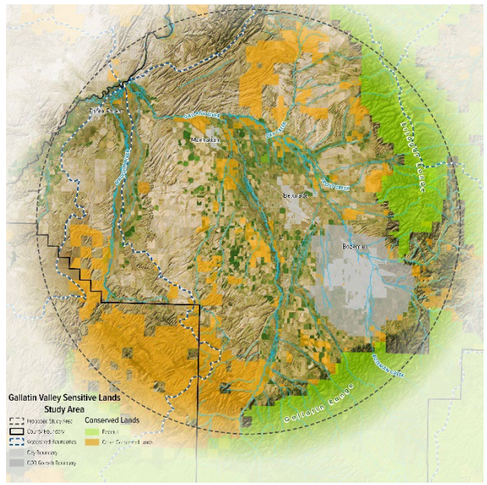
Overview

Residents of the Gallatin Valley are dedicated to securing the long-term ecological health of the entire region. A strong connection between clean water, abundant wildlife, productive agriculture, and cultural heritage has provided a high quality of life for generations. While, the area continues to experience unprecedented growth, a regional approach to protecting sensitive lands can help provide adequate habitat into the future. The Gallatin Valley Sensitive Lands Protection Plan is dedicated to helping preserve the long-term ecological health of the entire region. The project aims to:



- Create a regional model that connects clean water, abundant wildlife, productive agricultural, and cultural heritage.
- Recommend how to protect the most sensitive resources during unprecedented growth.
- Identify benefits and best practices in development in harmony with the natural environment.
- Facilitate dialogue between the city, county, agencies, constituents, and developers.

Literature, Policy, and Case Study Review

This report aims to evaluate current and past plans, literature, regulations, and case studies that will help inform the Gallatin Valley Sensitive Lands Protection plan. This report provides the initial data review to identify the interconnectivity and relationships between stressors and geography of their impacts on sensitive lands and identify data gaps and conflicts in recommendations. The report includes:

1. **Currently Adopted Guiding Plans in the Gallatin Valley:** Plans developed and adopted by local governing bodies within the study area that are currently guiding the growth and development of the region.

2. **Publications for Consideration:** Publications and resources from a variety of sources that can provide important information and data related to the plan.

3. **Implementation Tools:** Tools that could be used to inform and implement recommendations proposed in the plan including existing programs, regulatory tools, funding sources, partnership potential, incentives, etc.

4. **Existing Sensitive Lands Models covering the Gallatin Valley Study Area:** Existing models that will be considered for use in the plan.

5. **Models/Programs Case Study Review:** Case studies from similar projects in other locations.

6. **Example ArcHub Site Review:** Example ESRI ArcHub sites to use as examples for the Gallatin Valley Sensitive Lands Plan ArcHub site.

Part 1: Currently Adopted Guiding Plans in the Gallatin Valley

Within the Gallatin Valley government organizations have various plans in place to the support the growth of the community. This section evaluates local plans that are relevant to the Sensitive Lands Protection Plan and identified connections and conflicts between the adopted plans.

Plan	Year Adopted
Gallatin County Growth Policy	2021
City of Bozeman Community Plan	2020
Triangle Community Plan	2020
Envision Three Forks	2022
City of Bozeman Climate Vulnerability and Resiliency Strategy	2019
City of Bozeman Climate Plan	2020
City of Bozeman Parks, Recreation and Active Transportation Plan	In Progress

Currently Adopted and Relevant Plans Overview

Gallatin County Growth Policy (2021)

In 2021 the Gallatin County Growth Policy was adopted by the County Commission. A Growth Policy is required by state statute (Montana Code Annotated 76-1-601) and is meant to inform and guide the County's land use decisions. Not all land within Gallatin County falls under the purview of the Growth Policy. Large portions of the County (47%) are under the jurisdiction of State and Federal land agencies. In addition, Bozeman, Belgrade, Manhattan, Three Forks, and West Yellowstone have their own growth policies and other planning documents.

Relevance to Gallatin Valley Sensitive Lands Protection Plan:

Gallatin County upholds and advances values that protect the unparalleled beauty of its landscape, honor its rich history rooted in agriculture, and promote the development of healthy, welcoming communities that offer a variety of extraordinary opportunities.

The "Heritage" section of the plan celebrates Gallatin County's cultural and historical significance, which is represented by the tradition, charm, and western community character that permeates working lands, natural areas, and urban areas. These values include working agricultural lands, productive soil, minimal impacts to agricultural land from development, access to local food, balancing property rights with maintaining rural character, healthy native plant and wildlife habitat, the protection of areas important for wildlife movement and migration, and an abundance of healthy wildlife.

The "Open Space" section recognizes the importance of protecting the world-renowned natural environment and open space networks and their profound influence on our social, economic, and recreational activities that take place across Gallatin County. These values includes the protection of the natural environment; fish and wildlife resources; land use that is suitable for and compatible with natural features and environmental characteristics; social, economic, and recreational activities that take place within the open space network; public lands, and waterways; stewardship of public lands; supporting enhanced stewardship of private lands; key viewshed protection; and the physical and mental health benefits that open space access provides.

The "Opportunity" section focuses on the development of healthy and welcoming communities that offer a variety of cultural, recreational, and educational amenities. These values include the thoughtful planning of infrastructure, transportation networks, and community services; land use that follows logical settlement

patterns, concentrating development in areas where a full range of services are available and resulting in the fiscally-efficient delivery of public services; land use and development patterns that ensure and prioritize public health and safety from identified man-made hazards; developer responsibility for adequate provision of infrastructure; development that includes sustainable best practices and technologies, such as green building techniques and renewable energy resources; development regulations that are clear and consistent to the greatest degree possible; diversity and variety in neighborhood and housing options; educational excellence and abundant, accessible cultural opportunities; coordination with other towns and cities in the County to advance shared goals and priorities.

Integration into Gallatin Valley Sensitive Lands Protection Plan:

This plan establishes core goals and recommendations for wildlife habitat through a number of different lenses: water bodies, bald and golden eagle nests, other important wildlife habitat, higher value for wildlife, lower value for wildlife, and urban/urbanizing areas.

The map and associated matrix are intended to provide useful and non-regulatory information for considering fish and wildlife in land use planning, development projects, and conservation opportunities. These tools were created by Montana Fish, Wildlife and Parks (FWP) with extensive input from the Gallatin County Planning Department as part of the Gallatin County Growth Policy update in 2020. The map and associated matrix do not prescribe where development should or should not occur but instead provide general guidance on how to consider fish and wildlife resources on privately-owned lands within the jurisdiction of Gallatin County. This map is based on the best available data and professional knowledge of FWP biologists at the time the map was created. Because this guidance is general and the landscape is rapidly changing, land use planners, developers, and conservation professionals should continue to consult with FWP staff and U.S. Fish and Wildlife Service on plans and projects. In general, the wildlife value boundaries drawn on the map are located on identifiable landmarks for ease and logistics and the user should recognize that these boundaries are approximate, and that wildlife habitats and use do not necessarily change on that line.

City of Bozeman Community Plan (2020)

This Community Plan is a fundamental policy document guiding further growth and community development in Bozeman. It sets forth Bozeman's future growth policy for land-use and development. The purpose of the Plan is to guide the City's community planning and to evaluate and prioritize the City's actions moving forward. It reflects the community's shared values and priorities. The Plan is the City's long-range growth policy that meets the statutory requirements of Section 76-1-601 of the Montana Code Annotated.

This Plan helps guide residents, City staff, and elected officials' decisions. It brings land use policy into larger community discussions on many issues addressed by the City. Its measure of success is a continuation of the Bozeman tradition— a flourishing, safe, healthy, and a vibrant place to live, work, and raise a family.

Bozeman's Planning Area is generally the area of the City's future municipal water and sewer service boundary. It includes the City of Bozeman as well as a half-mile to two-mile area around the City in the Gallatin County jurisdictional area.

Relevance to Gallatin Valley Sensitive Lands Protection Plan:

The plan includes two themes that correspond to the Gallatin Valley Sensitive Lands Protection Plan:

Theme 4 - "A City Influenced By Our Natural Environment, Parks, and Open Lands"

- Our City is home to an outdoor-conscious population that honors and protects our natural environment and our well-managed open space and parks system.

Theme 7 - "A City Engaged in Regional Coordination"

- Our City, in partnership with Gallatin County, Montana State University, and other regional authorities, desires to address the needs of a rapidly growing and changing regional population through strategic infrastructure choices and coordinated decision-making.

Integration into Gallatin Valley Sensitive Lands Protection Plan:

The plan includes an emphasis on identifying and expanding open space, parks, and trails; identifying, prioritizing, and preserving key wildlife habitat and corridors; and reducing the impacts to environmentally sensitive areas that contribute to water quality, wildlife corridors, or wildlife habitat. One of the primary goals of the plan is lessening or eliminating development in environmentally sensitive areas and/or preserving areas.

The plan also includes a focus on working with the U.S. Army Corps of Engineers to keep wetlands mitigation within the Gallatin Valley rather than locating to other watersheds.

The plan considers floodplain regulations and mitigation efforts to minimize conflicts between humans and wildlife through the use of proactive, non-lethal measures.

Considerations and coordination is aimed at the regional level.

The plan attempts to keep rural areas rural by maintain a clear edge to urban development that evolves as the City expands outwards.

Triangle Community Plan (2020)

The intent of the plan is to coordinate land use development patterns, deliver community services and infrastructure, and protect important environmental resources, all in a manner that supports community values and vision while responding to rapid growth pressures. The plan boundary includes the Gallatin River to the West, Frontage Road to the North, Fowler Avenue to West Garfield Street to South 19th Avenue to the East, and Blackwood Road to Four Corners Water and Sewer District to the South.

Relevance to Gallatin Valley Sensitive Lands Protection Plan:

Relevant Project Goals:

- **Goal 4.1 -** Provide a coherent land use pattern that is compact and contiguous, which maximizes infrastructure efficiency, protects open space and agriculture, and encourages mixed use centers with opportunities for multimodal transportation.
- **Goal 4.2 -** Conserve and protect agricultural land and prime agricultural soils, and support local production of agricultural products.
- **Goal 4.3 -** Create and preserve open space areas in order to support natural resource functions, community well-being, public health, and quality of life for residents.
- **Goal 4.9 –** Support the function and maintain the connectivity of irrigation ditches and canals.
- **Goal 4.11 –** Conserve, protect, and manage water quantity. Protect and manage water quality.
- **Goal 4.12 -** Identify, conserve, and protect wetlands.
- **Goal 4.13 -** Identify, conserve, and protect important fish and wildlife habitat.
- **Goal 4.14 -** Continue efforts to inform residents about hazards and reduce impacts associated with those hazards.

The Triangle Community Plan includes an emphasis on coordination and communication between the various jurisdictions is vital to maintaining administrative efficiency and quality of life for all residents in a rapidly changing landscape. This approach may be useful to the Sensitive Lands Protection Plan.

Integration into Gallatin Valley Sensitive Lands Protection Plan:

The plan focuses on protecting existing agricultural activities and encouraging new appropriate and compatible agriculture activities; encouraging development designs that integrate significant agricultural opportunities, such as cluster development, community gardens, or agrihoods; explores voluntary opportunities such as Transferable Development Rights (TDRs) and cluster development provisions in zoning codes that provide opportunities to extract value from agricultural lands or develop property while still providing opportunities for agricultural production; and supports conservation easements with an agricultural component as tools for protection and preservation of important agricultural lands.

The plan supports opportunities to establish larger swaths of open space and parks instead of primarily relying on small parks from individual review of subdivisions; encourages connections between open space areas when feasible; offers opportunities for parkland dedication; and supports conservation easements as a way of preserving open space.

The plan supports efforts to map ditch systems; maintains current and abandoned ditches for their functions as important water management systems and infiltration systems that support late season flows and shallow aquifer recharge; and maintains consistent standards for access, maintenance, and setbacks.

The plan maintains floodplains, wetlands, and irrigation infrastructure, which all support the recharge of shallow groundwater aquifers and maintain late season flows; maintains current setback standards from irrigation infrastructure, wetlands, and watercourses; and encourages developments to employ Best Management Practices for projects along and adjacent to ditches, streams, and rivers in order to manage runoff of particulates, pollutants, and sediment into surface waters.

The plan explores tools to identify sensitive wetland areas in order to prioritize protection; and avoids impacts to wetlands and encourage mitigation, as required from the Army Corps of Engineers, to be done within the Gallatin Watershed.

The plan continues efforts to work with Montana Fish, Wildlife, and Parks to identify sensitive fish and wildlife habitat in the Triangle area in order to avoid and/or mitigate impacts from development on these resources; and continues to support conservation easements as a tool for preserving and protecting fish and wildlife habitat.

The plan supports efforts to update floodplain maps to better assess risk; and maintains natural flood control by encouraging implementation of Floodplain Regulations and discouraging building structures in the 100-year floodplain.

Envision Three Forks (2022)

The plan focuses on the City of Three Forks and its surrounding rural lands.

Using input from City residents, the plan aims to support the following principles:

- Protect public health and safety
- Respect private property rights
- Guide development to suitable areas
- Deliver services efficiently
- Keep pace with the demand for new housing
- Conserve agricultural resources and functions
- Protect hydrological resources and functions
- Protect the natural environment, including critical wildlife resources

  Develop and/or improve incentive mechanisms

The plan has nine total goals. Three goals are dedicated to each of the three focus areas: People, Economy, and Environment.

- **Our People Goal 1:** Offer accessible housing for residents of all ages, backgrounds, and abilities.
- **Our People Goal 2:** Preserve our small-town character and agricultural heritage.
- **Our People Goal 3:** Increase access to services, education, healthcare, and cultural experiences.

- **Our Economy Goal 1:** Enhance our beautiful and vibrant downtown.
- **Our Economy Goal 2:** Increase access to living-wage jobs.
- **Our Economy Goal 3:** Promote a diverse and resilient economy.

- **Our Environment Goal 1:** Coexist with the natural water systems surrounding three forks.
- **Our Environment Goal 2:** Preserve open space and natural lands.
- **Our Environment Goal 3:** Support a healthy and active community.

Relevance to Gallatin Valley Sensitive Lands Protection Plan:

The most relevant aspects of the plan include the environmental goals. These sections focus on coexisting with the natural water systems surrounding three forks, preserving open space and natural lands, and supporting a healthy and active community.

Integration into Gallatin Valley Sensitive Lands Protection Plan:

The plan prioritizes the floodplain mitigation project and work with property owners to implement the project, mitigating the amount and area of floodplain-affected properties and growth area within City boundaries; supports the relocation of structures within the 100-year floodplain zone; integrates stormwater management with an updated stormwater infrastructure plan; and adopts low impact development (LID) standards for development and promote the use of green infrastructure for stormwater filtration and the reduction of impermeable surfaces on a site.

The plan supports clustered residential development to preserve open space; supports infill and strategic development over sprawl; and supports development that mitigates or avoids negative impacts to riparian areas and wildlife.

The plan focuses on future dedication of trails, parks, and natural open spaces, and the connections between them.

City of Bozeman Climate Vulnerability Resiliency Strategy (2019)

Preparing for the continued and exacerbated effects of climate change, the City of Bozeman is taking a leading role to reduce key vulnerabilities of municipal facilities and build resilience in delivering its services. Building a resilient City is a continuous process of many collaborative and mutually supportive efforts, steps, and projects. Through the intentional plan development process and vulnerability assessment, the City has identified seven key resilience strategies with associated adaptation actions based on the impacts of climate change.

Relevance to Gallatin Valley Sensitive Lands Protection Plan:

The plan includes potential climate vulnerabilities related to the plan. These include extreme heat, floods, drought & reduced mountain snowpack, wildfire, winter storms.

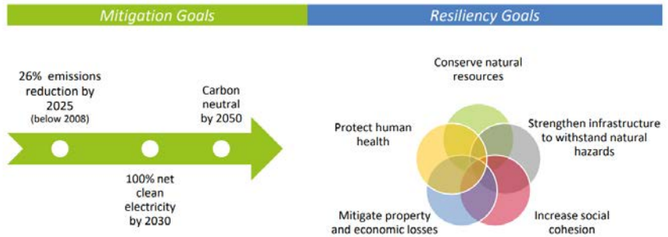
Integration into Gallatin Valley Sensitive Lands Protection Plan:

The potential climate vulnerabilities outlined in the plan (extreme heat, floods, drought & reduced mountain snowpack, wildfire, and winter storms) could inform the future level of sensitivity to lands and natural resources.

The Climate Resiliency Strategy focused on how climate change may affect the vulnerability of municipal facilities, but this data may be applied to lands and natural resources.

City of Bozeman Climate Plan (2020)

The Bozeman City Commission adopted the Bozeman Climate Plan in 2020. The Climate Vision, as stated in the plan, is "Through leadership and collaboration, the City of Bozeman will advance innovative solutions to cultivate a more equitable and resilient low-carbon community for current and future generation. The Climate Plan builds off of the 2019 City of Bozeman Vulnerability Assessment and Resiliency Strategy and outlines bold emissions mitigation targets and accompanying resiliency goals.



To reach these goals, the Climate Plan has 16 innovative, actionable solutions that are organized across the following six focus areas.

1. Healthy, Adaptive & Efficient Buildings
2. Responsible & Reliable Clean Energy Supply
3. Vibrant & Resilient Neighborhoods
4. Diverse & Accessible Transportation Options
5. Comprehensive & Sustainable Waste Reduction
6. Regenerative Greenspace, Food Systems, & Natural Environment

Relevance to Gallatin Valley Sensitive Lands Protection Plan:

Resiliency goals: Conserve natural resources, strengthen infrastructure to withstand natural hazards

Solution N. Cultivate a Robust Local Food System
- 6.N.1. Support the Formation of a Local Food Council
- 6.N.2. Help Develop a Food System Assessment and Security Plan
- 6.N.3. Encourage Local Agriculture and Preservation of Working Lands
- 6.N.4. Support Local Food Production, Processing, and Distribution

Solution O. Manage and Conserve Water Resources
- 6.O.1. Invest in Landscaping and Irrigation Upgrades at City Facilities
- 6.O.2. Build on the Success of Water Conservation Education and Incentives
- 6.O.3. Evaluate Additional Water Conservation Code and Water Rate Structure Adjustments

Solution P. Manage Land and Resources to Sequester Carbon
- 6.P.1. Protect Local Wetlands for Flood Resilience and Water Quality
- 6.P.2. Maintain and Expand the Urban Forest
- 6.P.3. Enhance Greenspace and Carbon Sequestration for New Development
- 6.P.4. Provide Outreach on Water Pollution Prevention and Carbon Sequestration Strategies

Integration into Gallatin Valley Sensitive Lands Protection Plan:

The plan may inform sensitive lands related to resiliency. The potential solutions related to the Sensitive Lands Protection Plan include Solutions N, O, and P (cultivate a robust local food system, manage, and conserve water resources, and manage land and resources to sequester carbon).

Common Themes between Currently Adopted Plans

The following table identify common themes and interconnectivity between plans for topics relevant to the Sensitive Lands Protection Plan.

Common Themes	Plans
Managing and Conserving Water Resources	Gallatin County Growth Policy (2021) City of Bozeman Community Plan (2020) Triangle Community Plan (2020) Envision Three Forks (2022)
Maintaining Agricultural Heritage	Gallatin County Growth Policy (2021) Triangle Community Plan (2020) Envision Three Forks (2022) City of Bozeman Climate Plan (2020)
Support for increased development density	Gallatin County Growth Policy (2021) Triangle Community Plan (2020)
Open Space Protection	Gallatin County Growth Policy (2021) City of Bozeman Community Plan (2020) Triangle Community Plan (2020) Envision Three Forks (2022)
Parks Planning	City of Bozeman Community Plan (2020) Triangle Community Plan (2020)
Thoughtful Infrastructure Planning	Gallatin County Growth Policy (2021) City of Bozeman Community Plan (2020) Triangle Community Plan (2020) Envision Three Forks (2022) City of Bozeman Climate Vulnerability Resiliency Strategy (2019) City of Bozeman Climate Plan (2020)

Common Themes	Plans
Soil Health	Gallatin County Growth Policy (2021) Triangle Community Plan (2020)
Air Quality	Gallatin County Growth Policy (2021) City of Bozeman Community Plan (2020)
Native Plants	Gallatin County Growth Policy (2021) City of Bozeman Community Plan (2020)
Fish and Wildlife	Gallatin County Growth Policy (2021) City of Bozeman Community Plan (2020) Triangle Community Plan (2020) Envision Three Forks (2022)
Movement and Migration	Gallatin County Growth Policy (2021) Triangle Community Plan (2020)
Recreational Opportunities	Gallatin County Growth Policy (2021) City of Bozeman Community Plan (2020) Triangle Community Plan (2020) Envision Three Forks (2022)
Viewshed Protection	Gallatin County Growth Policy (2021)
Climate Change	City of Bozeman Community Plan (2020) City of Bozeman Climate Vulnerability Resiliency Strategy (2019) City of Bozeman Climate Plan (2020)
Regional Coordination	Gallatin County Growth Policy (2021) City of Bozeman Community Plan (2020) Triangle Community Plan (2020)
Indigenous Involvement	Gallatin County Growth Policy (2021)
Protect Public Health and Safety	Gallatin County Growth Policy (2021) City of Bozeman Community Plan (2020) Triangle Community Plan (2020) Envision Three Forks (2022)
Respect Private Property Rights	Gallatin County Growth Policy (2021) Envision Three Forks (2022)
Deliver Services Efficiently	Envision Three Forks (2022)
Vibrant & Resilient Neighborhoods	Envision Three Forks (2022) City of Bozeman Climate Plan (2020)
Healthy, Adaptive & Efficient Buildings	City of Bozeman Climate Vulnerability Resiliency Strategy (2019) City of Bozeman Climate Plan (2020)
Responsible & Reliable Clean Energy Supply	Gallatin County Growth Policy (2021) City of Bozeman Community Plan (2020) City of Bozeman Climate Vulnerability Resiliency Strategy (2019) City of Bozeman Climate Plan (2020)
Diverse & Accessible Transportation Options	Gallatin County Growth Policy (2021) City of Bozeman Community Plan (2020) Triangle Community Plan (2020) City of Bozeman Climate Vulnerability Resiliency Strategy (2019) City of Bozeman Climate Plan (2020)
Comprehensive & Sustainable Waste Reduction	City of Bozeman Community Plan (2020)

Common Themes	Plans
	City of Bozeman Climate Vulnerability Resiliency Strategy (2019) City of Bozeman Climate Plan (2020)
Regenerative Greenspace, Food Systems, & Natural Environment	Gallatin County Growth Policy (2021) Triangle Community Plan (2020) City of Bozeman Climate Vulnerability Resiliency Strategy (2019) City of Bozeman Climate Plan (2020)

Conflicts between Currently Adopted Plans

None of the currently adopted plans are directly in conflict with each other. However, all of the community plans/growth policies address a variety of topics to provide for a thriving community.

Gallatin County Growth Policy (2021)

The "opportunity" section of the plan has a greater focus on human development rather than a focus on the natural resources. The plan focuses on infrastructure, transportation networks, community services, settlement patterns, safety from man-made hazards, green building techniques, renewable energy, and diversity of housing options.

City of Bozeman Community Plan (2020)

There are sections in this plan that are more focused on human benefits/interactions with the environment. These topics include parks and recreation, public health, resource usage, water treatment, building standards, transportation, and climate change implications related to the built environment.

The plan indicates that the improvement habitat, water quantity, and water quality will be evaluated while giving due consideration to the impact of City regulations on economic viability. There is potential that this consideration may overshadow the importance of natural resource protection.

Triangle Community Plan (2020)

The plan is focused on development, public health, resources use, transportation. These human-focused topics may detract from identifying and protecting sensitive lands.

Envision Three Forks (2022)

The plan is focused on public health and recreation. These human-focused topics may detract from identifying and protecting sensitive lands.

City of Bozeman Climate Vulnerability Resiliency Strategy (2019)

This plan is limiting in that it focuses on the impacts of climate change to Bozeman's municipal facilities.

City of Bozeman Climate Plan (2020)

This plan is focused less on existing sensitive lands, and more on developing sustainable human infrastructure on the land. It focuses on the topics of building efficiency, clean energy, neighborhood resiliency, diverse and accessible transportation, waste reduction, and regenerative greenspace and food systems.

City of Bozeman Parks, Comprehensive Parks, Recreation, and Active Transportation (PRAT) Plan (2023 in progress)

To be completed

Part 2: Publications for Consideration

The publications and resources reviewed in this section were provided by the Gallatin Valley Sensitive Lands Protection Plan Working Group. They were identified as sources of information that could be useful to inform the plan or provide data to include in the plan.

Plan	Year Adopted
Critical Lands Study of Bozeman Area	1997, Not Formally Adopted
Montana Department of Fish, the Wildlife and Park's Fish and Wildlife Recommendations for Subdivision Development	2012
Montana State Wildlife Action Plan	2015
USFS Custer Gallatin Forest Plan (2020)	2020
Online Publications by Montana Natural Heritage Program	
Long Range Plan for Gallatin County (2019- 2024)	2019-2024
MTFWP Comments on the Missoula Area Land Use Map and Land Use Element Review	2019
MSU Ecology Analysis	2022

Critical Lands Study of the Bozeman Area (1997)

The Bozeman City-County Planning Board initiated the development of the Critical Lands Study as a supplement to the implementation of the 1983 Bozeman Area Master Plan. The overarching goal of the plan was to establish ways to protect the unique physical setting and environmental features in the Bozeman area. The objectives of the planning process were to identify aspects of the physical environment which present problems for development and/or have uniqueness or public value, include the public in the process, and develop the mechanisms which can provide the Bozeman community with a pattern of development that protects these valuable and unique resources in an economically sound manner.

The study identified seven types of critical lands: wetlands; floodplains; rivers, streams, and ditches; groundwater aquifers and recharge zones; geologic constraints; farmland and open space; fish and wildlife habitat. For each critical land category the study contains information on functions and values, threats, regulations and programs in place to protect critical lands, goals and objectives, maps and location of the lands in the City-County planning jurisdiction, and protection options.

Plan Conclusions

The study concluded with next steps for the City and County to take to reach the goals and objectives of the study. In summary, the plan proposed:

- Developing a new chapter in the Bozeman Zoning Ordinance titled Critical Lands Districts what would include regulations for development in or near identified critical lands.
- Include in the Bozeman Zoning Ordinance provisions to allow purchase/transfer of development rights, cluster development, etc.

- Incorporate the requirement for a Soil Erosion and Sedimentation Control plan.
- Initiation the process to develop a Bozeman Area Open Space Plan.
- Adopt fire protection guidelines for the urban and wildland interface.
- Support public education efforts
- Work with non-profit organizations in the community to protect farmland and/or open space.

Ultimately, the City of Bozeman did not adopt the plan and the proposed next steps were not put into action.

Integration into Gallatin Valley Sensitive Lands Protection Plan

Data and information from the 1997 Bozeman Area Critical Lands study will not be directly utilized for the current Sensitive Lands Protection Plan. The plan was never adopted and put into action. The plan will be reviewed by the project team for possible implementation strategies that could be carried forward in light of this new planning effort.

Montana Department of Fish, the Wildlife and Park's Fish and Wildlife Recommendations for Subdivision Development (2012)

The MDFWP recommendations for subdivision development were developed for use by FWP biologists, local governments, and developers to generate an open discussion on the implementation of consistent fish and wildlife conservation recommendations for subdivision development in Montana. The recommendations are designed to help guide fish and wildlife professionals, and to help inform municipal and county leaders and land developers. The recommendations were compiled by knowledgeable biologists and planners who have drawn from the best available science of wildlife biology and land use planning. Specific topics for recommendations include the subdivision application and review process, conservation of water bodies, big game winter range, public hunting, human/bear conflicts, native vegetation communities, and Species of Concern.

Plan Conclusions

The plan provides seven recommendations specific to the sub-division planning process in Montana. These recommendations are summarized in the following bullets:

1. Developers planning to sub-divide land in Montana should consult with MTFWP biologists and land use specialists prior to selecting a site for development so that developers can fully understand and consider key habitat issues that may be associated with proposed subdivision development at a particular location.
2. Developer should utilize public domain fish and wildlife information sources and the *Fish and Wildlife Information Checklist* provided in the plan appendices. Specific reference to the MTFWP Crucial Areas Planning System (CAPS) for use as a sitting tool is also recommended.
3. Local municipalities should consider making the *Fish and Wildlife Information Checklist* a required element of a sub-division development application.
4. Local municipalities and developers should use the Fish and Wildlife Impact Assessment (FWIA) tool for addressing local Environmental Assessment requirements. In addition, municipalities and developers should use the *Summary of Probable Impacts* (SPI) guidance when addressing the local SPI requirements.
5. Local municipalities should consider including in local subdivision regulations a set of science-based development design standards for conserving important fish and wildlife resources.
6. For local municipalities that do include science-based development design standards in local subdivision planning, consider establishing a process where developers have the option to propose alternatives to the adopted standards.
7. Local municipalities should consider the detailed recommended design standards provided in the plan when updating local sub-division regulations and considering development applications. Developers should consider these recommended design standards as guidance when sitting and designing proposed projects.

Integration into Gallatin Valley Sensitive Lands Protection Plan

Recommendations for subdivision development related to habitat conservation may be considered for inclusion in the Sensitive Lands Protection Plan. The recommended MTFWP CAPS tool does not appear to be available online currently, although it may have been incorporated into other statewide or regional planning tools since 2012. During the recommendations phase of this planning effort, the project team will identify gaps/opportunities to integrate these recommendations into local land use codes.

Montana State Wildlife Action Plan (2015)

The Montana State Wildlife Action Plan (SWAP) identifies wildlife and plant species that are in the greatest need of conservation effort and provides rationale for funding through grant applications to implement conservation actions and programs intended to maintain sustainable native populations and habitats statewide. The SWAP also serves as the required supporting documentation for Montana FWP to participate in the federal State Wildlife Grant funding program ratified by congress in 2000. The Montana SWAP identifies priority community types, Focal Areas, and species to inform FWP's priorities and decisions and to assist other agencies and organizations in making decisions on where to focus their conservation efforts and funding.

Plan Conclusions

The Montana SWAP identifies three tiers of terrestrial communities for prioritization of conservation efforts. Community types identified as the highest priority (Tier I) include floodplains, riparian areas, wetlands, and open water due to the level of biodiversity supported by wet landscapes in Montana. Other community types that support a high percentage of species diversity identified as Tier I include alpine grasslands and shrublands, conifer dominated forest and woodlands (both mesic and xeric types), deciduous shrublands, prairie grasslands, montane grasslands, scrub and dwarf shrublands, and sagebrush steppe.

The Madison River is the only intermountain river located within the Sensitive Lands Protection Plan study area identified in the SWAP as a Tier I community type. All smaller streams within the Sensitive Lands Protection Plan study area are identified as Tier I priority areas. Aquatic Species of Greatest Conservation Need (SGCN) associated with this community include Artic Grayling, Bull Trout, Columbia River Redband Trout, Lake Trout, Northern Redbelly Dace, Pygmy Whitefish, Torrent Sculpin, Westslope Cutthroat Trout, and Yellowstone Cutthroat Trout.

The Montana SWAP identifies the Shields River watershed as an aquatic focal area for its unfragmented Yellowstone Cutthroat Trout population in the Yellowstone River Basin. This area is located adjacent to the Sensitive Lands Protection Plan study area. No terrestrial focal areas are identified within the Sensitive Lands Protection Plan study area.

Integration into Gallatin Valley Sensitive Lands Protection Plan

Aquatic and terrestrial community type and species designations should be considered for use in the Sensitive Lands Protection Plan for consistency in terminology between state and local planning efforts and spatial data consistency.

USFS – Custer Gallatin Forest Plan (2020)

The Custer Gallatin National Forest (CGNF) includes over 3 million acres in Montana and the northwest corner of South Dakota. Geographic areas within the CGNF that are located within or adjacent to the Sensitive Lands Protection Plan study area include the northern Gallatin Mountains, the Southern Bridgers Mountains, and the southern Bangtails Mountains. The CGNF Land Management Plan (LMP) sets the overall context for informed decision making by evaluating and integrating social, economic, and ecological considerations relevant to management of the national forest. Areas of specific direction included in the LMP center around identifying priority watersheds for maintenance and restoration, identifying geographic areas that may require special management decisions, and

providing management direction for the multiple uses and ecological and social resources within the CGNF with the ultimate goal of long-term sustainability.

Plan Conclusions

The CGNF LMP does not provide specific conclusions or approvals for management actions. The LMP does provide information on forest wide goals, objectives, standards, guidelines, and desired conditions for ecological resources within the national forest planning area. Desired conditions describe the overall vision for the CGNF and other plan components (goals, objectives, standards, guidelines) provide guidance on how the USFS and partners may achieve those conditions. The LMP acknowledges that some of the desired conditions may require several decades or longer to achieve but also notes that the NF must move forward and make progress towards achieving these conditions.

Integration into Gallatin Valley Sensitive Lands Protection Plan

Baseline information and desired conditions for specific geographic areas within or adjacent to the Sensitive Lands Protection Plan study area should be considered for inclusion (or acknowledgement) in the Sensitive Lands Protection Plan. Although the USFS central objective is to manage the lands and resources under its administrative control in a manner that promotes long-term sustainability of all valued resources, the USFS multiple use mandate may result in some currently approved uses being in conflict with the long-term goals of the Sensitive Lands Protection Plan. These potential conflicts should be discussed and identified in the Sensitive Lands Protection Plan in order to develop potential solutions that may bring both plans into alignment.

Long Range Plan for Gallatin County (2019-2024)

The National Resource Conservation Service (NRCS) Gallatin County Long Range Conservation Strategy provides an overview of Gallatin County geography, ecology, climate, and resource information and concerns. Resource concerns are divided into seven categories including Soil, Water, Plants, Animals, Air, Energy, and Human.

Plan Conclusions

One important conclusion identified in the strategy is that over the past several decades the economic benefits realized by agricultural producers in the county has fluctuated significantly due to volatility in commodities markets. This volatility has generally led to the subdivision and development of agricultural lands becoming a more stable and profitable way of life for agricultural landowners. Also identified in the strategy is the fact that since 2001, agricultural farming is the only employment sector in the county that has experienced an overall loss of jobs. Even with this volatility in agricultural production and overall decline in farming employment, Gallatin County continues to be one of the most stable Montana counties economically due to the presence of Montana State University, the United States Department of Agriculture offices in Bozeman, and a consistent tourism sector driven by the proximity to Yellowstone National Park and multiple world-class winter recreation areas.

The strategy also provides an excellent overview of land use and resource related issues within Gallatin County. Each land use/resource is addressed in a concise manner and highlights the main concern related to each type of area.

Integration into Gallatin Valley Sensitive Lands Protection Plan

The Sensitive Lands Protection Plan should consider referencing the Long-Range Strategy document and/or incorporating and updating the resource concerns overview.

MTFWP Comments on the Missoula Area Land Use Map and Land Use Element Review (Montana Fish, Wildlife, and Parks 2019)

In late December 2018 and early January 2019, biologists and managers with the Montana Department of Fish, Wildlife and Parks (FWP) met in Missoula to discuss the Missoula Area Land Use Map and Element and provide recommendations to Missoula County to accommodate fish and wildlife as the City of Missoula expands.

Plan Conclusions

MTFWP provides several detailed recommendations on approaches to sustaining fish and wildlife populations in the Missoula area. Among these are three overarching themes to guide responsible development in the Missoula Valley:

1. Protection and enhancement of stream corridors and associated riparian areas that are the most ecologically important and imperiled habitats for fish and wildlife species in western Montana.
2. Protection of important grassland habitats that are relatively rare in western Montana but provide critical resources for game and nongame wildlife communities, many of which are declining in North America.
3. Accommodation of geographic funnels and terrain features (e.g., riparian corridors, ridgelines, timbered draws, passes) that naturally guide wildlife to certain areas in harsh weather conditions and during seasonal movements and migrations.

Integration into Gallatin Valley Sensitive Lands Protection Plan

General landscape scale recommendations provided by MTFWP on the Missoula Land Use Map are highly relevant to the Sensitive Lands Protection Plan and should be considered for update and inclusion. Site specific recommendations are not applicable to the Sensitive Lands Protection Plan and do not need to be considered for inclusion.

MSU Ecology Analysis (2022)

MSU Professor Andy Hansen et al. have developed a Biodiversity Conservation Priority Index (BCPI) based on ecological value and risk of habitat loss for remaining areas of natural vegetation cover (NVC) in the northwestern United States. This work seeks to address two questions: (1) Which remaining NVC on private lands is the highest priority for biodiversity conservation based on ecological value and risk of development? And (2) are conservation easements in NVC placed preferentially in locations of high biodiversity conservation priority?

The approach integrates five metrics of ecological structure, function, and composition to quantify ecological value of NVC. Ecological metrics include net primary productivity, species richness, ecosystem type representation, imperiled species range rarity, and connectivity among “Greater Wildland Ecosystems”.

Plan Conclusions

High BCPI values were associated with suburban and rural development, roads, urban proximity, valley bottom landforms, and low intensity of current development within the study area. Existing conservation easements were observed to be distributed more towards lower BCPI value areas than unprotected NVC at both the study area and region scales.

Integration into Gallatin Valley Sensitive Lands Protection Plan

The results of this study and model are relevant to the Sensitive Lands Protection Plan and should be considered for inclusion.

Part 3: Implementation Tools

Existing Code and Regulations

Gallatin County Zoning Regulations

Zoning regulations are adopted in conformity with the Growth Policy to the greatest extent possible under existing Montana State law. The County currently has 22 different Zoning Districts. Zoning may regulate various components of development or impacts from development, including building setbacks, building height, density, use, landscaping, and other standards and provisions. The recently adopted Growth Policy calls for the update of Zoning Regulations, creation of a Future Land Use map, update of the Floodplain Management Ordinance, updates of the subdivision regulations to be consistent with the goals and policies.

Bozeman Code

The Unified Development Code update for Bozeman is in progress. The current code has significant direction in place to protect sensitive lands in the city limits with applicable setbacks, watercourse protections, etc.

Funding Sources, Partnerships, and Conservation Tools

Gallatin County Open Lands Tax & Program

In 2018 Gallatin County voters passed the Open Space Levy that allows an up to 4.5 mills for open space conservation, with .5 being transferred to parks fund for capital improvements and maintenance. Conservation Projects (3.25 mills) are projects related to the purchase of land and conservation easements to conserve farm and ranch lands, provide recreation, protect water quality of streams and rivers, manage growth, protect wildlife areas, and Other Eligible Projects (0.75 mills) are those capital improvements and maintenance projects that support the purpose of the open space levy and are eligible for funding under the Levy.

“The Gallatin County Open Lands Board seeks to preserve open space lands for the enjoyment of present and future generations. The diverse acreage includes rich agriculture lands, serene mountain settings, parks, unique wildlife habitats, streams and lakes, historic areas and trail corridors. A prime goal of the Open Space Program is to preserve and enhance the County's uniqueness -- its striking mountain vistas, rolling agriculture plains, fish-filled streams and abundant wildlife.”

In 2022, the Open Space Mill Levy collected nearly $1.8 million in revenue from property taxes. The mill levy’s supports open land projection through funding conservation easements by project applicants. The County Open Lands Program has provided funding to conserve 50,000 acres of open space in the County, across 58 conservation easement. The County manages a 100-acre regional open space in Bozeman.

Gallatin Valley Land Trust & Montana Land Reliance

The GLVT and Montana Land Reliance work with Gallatin County Open Lands to conserve areas in Gallatin Valley, and beyond, through conservation easements. Funds from the Gallatin County Open Lands tax are provided to these non-profits through the application process. Recent projects include conserving a nearly 800-acre bison ranch and 300 acres of grain and hay operations.

GVLT Mission: Gallatin Valley Land Trust connects people, communities, and open lands through conservation of working farms and ranches, healthy rivers, and wildlife habitat, and the creation of trails in the Montana headwaters of the Missouri and Upper Yellowstone Rivers.

Montana Land Reliance Mission: The Montana Land Reliance partners with private landowners to permanently protect agricultural lands, fish and wildlife habitat, and open space.

Candidate Conservation Agreement with Assurances

https://www.fws.gov/service/candidate-conservation-agreements-assurances#:~:text=What%20is%20a%20CCAA%3F,become%20candidates%20in%20the%20future.

The Candidate Conservation Agreement with Assurances program started in 2005 by the U.S. Fish & Wildlife Service. A CCAA is a voluntary agreement that provides incentives for non-federal landowners to conserve candidate and other unlisted species likely to become candidates in the future. For the length of the agreement, landowners agree to undertake specific activities that address the identified threats to the target species. In return for the participant's voluntary conservation action(s), the Service issues an Enhancement of Survival Permit under section 10(a)(1)(A) of the ESA. The permit, which goes into effect if the covered species is later listed as endangered or threatened under the ESA, provides assurances that, if the species is subsequently listed and no other changes have occurred, the Service will not require the permittee to conduct any additional conservation measures without consent. Additionally, the permit authorizes a specific level of incidental take of the covered species, should listing occur.

The agreements created site-specific conservation plans tailor made to mesh with a rancher's operation to protect riparian habitat, improve in-stream flows, protect fish passage, and keep fish from being lost in irrigation ditches. In return, ranchers who signed onto the program received peace of mind knowing they'd be protected should a judge decide that Arctic grayling belong on the endangered species list. Today, there are over 30 ranching families involved in the program that's been instrumental in doubling grayling populations and improving riparian habitat for dozens of other native species.

University of Montana Voter Survey on Public Lands

https://crown-yellowstone.umt.edu/voter-surveys/2022/

The 2022 Voter Survey on Public Lands was commissioned by the University's Crown of the Continent and Greater Yellowstone Initiative (COCGYI). The biannual survey has tracked opinions of likely voters in Montana since 2014 and seeks to understand how residents think about public land and natural resource issues. Some survey findings include:

> "Bipartisan consensus for wildlife corridors and enhanced conservation funding
>
> According to the survey, protecting wildlife migration corridors is a popular bipartisan priority. Eighty seven percent of Montana voters support constructing more wildlife crossing structures, 86% support providing incentives to landowners to conserve private lands, and 81% support managing larger blocks of public lands as wildlife habitat. The survey also finds very strong bipartisan support for continuing to direct tax revenue from the sale of recreational marijuana toward conservation programs administered by Montana Fish, Wildlife and Parks. Eighty-two percent of voters say the state Legislature should continue using recreational marijuana taxes to support wildlife conservation, create public access and maintain state parks and trails.
>
> Continued support for public land protection
>
> As in past years, the 2022 survey finds cross-party support for several citizen-initiated efforts to protect public lands. These proposals require Congressional approval and include: • More voters than ever, 83%, support the Blackfoot Clearwater Stewardship Act to expand protections on public lands adjacent to the Bob Marshall Wilderness. • 77% of voters support a proposal to protect a Wilderness Study Area in the Gallatin Range near Yellowstone National Park. • 71% of voters support the Lincoln Prosperity Proposal to increase protections on national forest lands, boost recreation opportunities and promote forest restoration near the town of Lincoln. This year's survey also finds strong support for some national strategies aiming to protect public and private lands. For instance, 78% of voters support the president's ability to protect existing public lands as national monuments, and 66% of voters support the America the Beautiful Initiative, a national policy that seeks to conserve 30% of America's land and 30% of its oceans by the year 2030. Finally, when it comes to management of public lands, 79% of voters say it's important for Native American tribes to have a stronger role in decisions that impact public lands when they are sacred or historically important to tribes."

Legislative Initiatives

Farm Bill

The farm bill, renewed every five years, is the federal government's main package of legislation for agriculture and food policy. Tucked inside this critical bill are numerous conservation programs that spur healthier habitat, cleaner water, and more sustainable landscapes and provide a lifeline to fish and wildlife. The conservation provisions of the Farm Bill provide billions of dollars a year for voluntary conservation of soil, water, and wildlife habitat on private lands through delivery of financial and technical assistance to our nation's farmers, ranchers, and non-industrial forest landowners.

The U.S. Fish and Wildlife Service coordinates with the U.S. Department of Agriculture to provide technical assistance in the development, implementation and evaluation of Farm Bill conservation programs and initiatives to meet shared conservation goals.

Many of the programs are outlined here: https://www.trcp.org/farm-bill/

Recovering America's Wildlife Act (Proposed)

The Recovering America's Wildlife Act will allow the states, territories, and tribes to invest $1.4 billion annually in proactive, on-the-ground, collaborative efforts to help species at risk by restoring habitat, controlling invasive species, reconnecting migration routes, addressing emerging diseases, and more. The bill will:

- Provide state and territorial wildlife agencies with $1.3B annually so they can implement their federally-approved Wildlife Action Plans.
- Invest $97.5M annually in the wildlife conservation efforts led by Tribal Nations.
- Allot 10% of dedicated annual funds towards the implementation of a competitive grants program aimed at fostering regional cooperation among states.
- Leverage funds from state agencies, universities, and non-governmental organizations to boost the power of federal conservation spending.
- Provide greater regulatory certainty for industry and private partners by conserving species and avoiding the need to list them under the Endangered Species Act.

Empower wildlife professionals to hold the nation's wildlife in the public trust for generations to come by providing state and tribal agencies with the flexibility to conserve populations in an effective and cost-efficient manner.

Part 4: Existing Sensitive Lands Models covering the Gallatin Valley Study Area

See formatted PDF

Part 5: Models/Program Case Study Review

Five case studies related to landscape level conservation models and programs from other areas were reviewed. Each case study highlights constituents that were involved, challenges the model/study was addressing, the impact of the model, and the overall model methodology. Case studies that warrant further evaluation to analyze how their program worked, or did not work, could be followed up with program managers interviews to assist in discussion of preliminary recommendations, including funding and implementation steps (code, etc.).

Case Study One: Lake Chelan WA Community Open Space Vision (A Trust for Public Land Greenprint)

Who prepared the model?

- The Trust for Public Land GIS and Planning Unit

- What other constituents were involved in its creation?
  - Core team included staff from Chelan-Douglas Land Trust, the Lake Chelan Trails Alliance, the City of Chelan, and TPL.
  - Technical Advisory Team – experts in the areas of focus for the plan including recreation, fish and wildlife, trail design, DNR, USFS, public utilities, and more (p. 50 in the report). The Technical Advisory Team of local experts provided strategic advice on data collection and modeling.
  - The report also lists others that were interviewed (p. 49) and participated in community meetings.
  - Overall, they reported engaging with over 1,000 people through a mix of engagement strategies including speak-outs, community meetings, ground truthing, interviews and community surveys.
- What answer or problem what is the model attempting to elucidate?
  - To create a shared vision for land protection and stewardship.
  - They developed a shared mission statement: "To steward our valley's open spaces in ways that improve access, protect environmental quality, and enhance the vitality of residents and visitors."
  - Top open space goals identified during stakeholder and community outreach: 1. Protect water quality; 2. Promote community health through increasing access to trails, parks, and the lake; 3. Protect wildlife habitat; and 4. Preserve agricultural land.
- What was the impact or long-term outcome of the model?
  - The constituents identified potential funding mechanisms (p. 42) and implementation ideas (p. 43) including working with willing landowners for voluntary land protection, develop new trails and improve existing, improve the park, recreation and open space plan, promote low impact development and green infrastructure, develop education programs, strategies to reduce lake pollution and more.
  - There is an online decision support tool here.
  - The plan was completed in March 2018. Follow-up is required with members of the core team to understand outcomes since 2018. I would recommend following up with the Chelan-Douglas Land Trust first.
- Is the methodology described, and can you reference any publications?
  - The GIS team from TPL worked with community meeting participants and a technical advisory team to create maps for each of the open space goals listed above and an overall map combining the goals. Through analyzing and modeling spatial data, regional priorities were translated into objective metrics, and maps highlighting the areas where voluntary land conservation and public land management strategies could best meet community goals.
  - Detailed data matrix is here. It describes the base data used and is organized by priority goal and overall priorities map with detailed methodology descriptions for each criteria model.
  - The general project approach methodology can be inferred from the report.

Case Study Two: The Intertwine - Regional Conservation Strategy for the greater Portland-Vancouver Region

- Who prepared the model?
  - The Intertwine Alliance—a broad coalition of public, civic, private, and nonprofit organizations dedicated to building a world-class system of parks, trails, and natural areas. The Intertwine Alliance was formed in 2009 to ensure that the region's network of parks, trails, and natural areas is completed and cared for, and to help the region's residents connect with nature and live active, healthy lives
- What other constituents were involved in its creation?
  - A number of lead partners and other partners are listed on the website.
- What answer or problem what is the model attempting to elucidate?
  - The Intertwine vision calls for the creation of "a bi-state regional biodiversity recovery and management plan that would, among other goals, identify significant natural areas for acquisition and protection, develop innovative strategies to conserve the region's natural resources, and ensure that large and small refugia are interconnected in every neighborhood and watershed in the region."
  - The vision calls for specific outcomes that would result in the protection of a diversity of habitat types, plants, and animals across the urban and rural landscape; acquisition, restoration, and management of habitat connectivity for fish and wildlife; and long-term protection of the ecological integrity of streams, wetlands, rivers, and floodplains.
  - They also include access to nature, climate change issues and development pressures.
- What was the impact or long-term outcome of the model?
  - The desired outcomes of The Intertwine vision are as follows:
    - Ensure that the diversity of habitat types, plants, and animals is protected, conserved, and restored across the region's urban and rural landscapes.
    - Acquire, protect, conserve, and manage functional habitat connectivity for wildlife (e.g., corridors, landscape permeability) and create connections between habitat areas.
    - Control invasive plant, animal, and aquatic species and reestablish native species.
    - Create a healthy urban forest canopy that contributes to improvements in stormwater management and air quality.
    - Maintain the long-term ecological integrity of streams, wetlands, rivers, and floodplains, including their biological, physical, and social values.
  - They are using the plan to make the case for Federal funding though it's difficult to find statistics on exactly how much has resulted from the use of the plan.
  - They are using the plan to support local ballot and dedicated funding sources: https://www.theintertwine.org/endorsements-november-2022-ballot with the goal to create 1 billion in funding by 2024 for parks, open space, conservation and restoration.
- Is the methodology described, and can you reference any publications?
  - Chapter 3 in the Regional Conservation Strategy for Greater Portland-Vancouver Region describes the integration of many Federal, state, local and organization –driven plans into this overarching plan.
  - The data, tools, and maps come from the Biodiversity Guide for the Greater Portland-Vancouver Region, a companion guide to the overall conservation plan. The Biodiversity Guide includes mapping and GIS modeling completed specifically for this project and provides important tools for conservation practitioners and decision makers: a narrative that describes the composition and patterns of biodiversity across the region, a land cover map at a scale suitable for analysis of urban and near-urban areas, and a data-driven GIS model of conservation priority areas.
  - An important benefit of the planning approach is the flexibility to analyze data at any scale, from the 3,000-squaremile region to the local and neighborhood scales.
  - The Biodiversity and Riparian habitat model approach is described in Appendix B on page 171 and is the most useful in describing the GIS methodology. They used a raster-based analysis format to map and analyze the region as square pixels in a rectangular grid. Each pixel was scored uniquely based on the

science-based criteria. They included a high-resolution (5-meter) regional land cover map and data on wetlands, bodies of water, food plains, soil types, and roads.
    - The interactive map viewer, data and documentation can be found here and was created by GreenInfo Network, a CA-based GIS organization.

Case Study Three: Roaring Fork (CO) Watershed Biodiversity and Connectivity Study

- Who prepared the model?
    - Colorado Natural Heritage Program
- What other constituents were involved in its creation?
    - Watershed Biodiversity Initiative and science team members from organizations, federal, state and local agencies – list in Appendix A on page 76 here.
    - They are collaborating with local constituents and funders. Funders included Pitkin County, EPA, Town of Aspen and Carbondale.
- What answer or problem what is the model attempting to elucidate?
    - Declines in elk, mule deer, big horn sheep and other common species in the watershed
    - They wanted a science-based approach to identify areas to protect or restore to improve biodiversity with a landscape perspective. The Roaring Fork watershed is almost 930,000 acres and houses 32,000 people.
- What was the impact or long-term outcome of the model?
    - The study was just completed in 2022 but the intended outcomes are to use the decision support tool and maps to identify conservation and restoration opportunities on public and private lands, engage the community to support conservation actions and minimize conflicts and support collaborative conservation and public/private partnerships.
- Is the methodology described, and can you reference any publications?
    - The took a unique approach and framed the study around key focal species that were in decline (elk, mule deer and big horn sheep) because their habits are the most threatened and protecting those lands could meet multiple biodiversity and connectivity objectives for many species. From the report: "Also, there was the thought among Project and Science Teams that, by identifying high quality, well-connected areas across the multiple habitat types used by these wide-ranging species, habitats important to many other species would be included as well."
    - The key analyses and mapped outputs (models) of the study were 1) Habitat Quality for elk, mule deer, and bighorn, and 2) Conservation Importance—critical areas for focal species as well as other biodiversity values, culminating in 3) Conservation and Restoration Priorities across the landscape (See page 8 of the report for methods overview).
    - Study design is outlined on p. 23 of the report.

Case Study Four: Santa Cruz County (CA) Conservation Blueprint

- Who prepared the model?
    - Santa Cruz Land Trust with extensive input and support of partners
- What other constituents were involved in its creation?
    - Two teams (referenced on p. ix):
        - Planning Team: Land Trust of Santa Cruz County, Bay Area Open Space Council, and consultants
        - Technical and Planning Analysis Team that advised on the model: UC Davis Hopland Research and Extension Center; UC Berkeley Cooperative Extension; Creekside Center for Earth Observation; Green Info Network; MIG Inc., and other consultants
    - Funders are listed on page ix
    - Constituents are listed on pages x to xi.
- What answer or problem what is the model attempting to elucidate?

    - Conservation challenges in water shortages and pollution, habitat loss and fragmentation, climate change, and threats to the viability of local agriculture.
    - The goal was to identify strategies and specific actions to achieve four conservation goals in 1) biodiversity, 2) water resources, 3) working lands, and 4) recreation and healthy communities.
    - A key goal was to design a network of conservation lands that could build upon the existing protected lands (Conservation Lands Network Model).
- What was the impact or long-term outcome of the model?
    - It will serve as a strategic tool over the next 25 years for the Land Trust of Santa Cruz County to 1) make informed conservation choices and investments; 2) enhance cooperation and coordination; 3) accelerate the pace and effective ness of conservation and 4) better position the County and region for state, federal, and private funding for land protection and resource stewardship. It is also to serve as a resource for conservation partners, non-profit organizations, landowners, and other community constituents to collaboratively advance conservation efforts.
    - The model identified nine multi-benefit conservation areas within the county (Figure ES1 on page xvi) that met the selection criteria and were most likely to contribute to multiple goals across the four conservation areas. These multi-benefit areas were prioritized based on four criteria: 1) scale of conservation impact and multiple conservation benefits; 2) challenges/threats; 3) opportunities/funding; and 4) ecosystem integrity and long-term stewardship. These are discussed in further detail on page 35.
- Is the methodology described, and can you reference any publications?
    - Biodiversity planning process and methodology is located on page 48 while strategies are discussed on page 86. An overlay analysis was used with elements described on page 82. Conservation lands network methodology is described on page 65. Habitat connectivity analysis objectives are described on page 69. Climate change resilience strategies are described on page 78.
    - Water resource conservation goals are described on page 121. Water quality monitoring and interactive websites are listed on page 115.
    - Working Lands conservation criteria and goals are listed on pages 143 – 144.
    - Recreation and Healthy Community goals are listed on page 151 and criteria on page 162.
    - Appendix B is where Conservation Lands Network Model is described in more technical detail. It is summarized on page B-1 and was developed with the aid of Marxan, a computer program that has been utilized in conservation planning projects worldwide. Vegetation data sources used are outlined in Table B-2. Vegetation rarity categories were created. Fine filter data sources are outlined in Table B-4. Landscape units, planning units, and suitability and cost are described. Section B-6 discusses model parameters and settings followed by analysis and solution.
    - Appendix C discusses the Habitat connectivity analysis.
    - Appendix D outlined developed and protected lands in the Bay Area.

Case Study Five: Bainbridge Island (WA) Conservation Plan and Update

- Who prepared the model?
    - Bainbridge Island Land Trust (WA)
- What other constituents were involved in its creation?
    - Listed on page 9 of the report linked above – a small set of constituents from the City of Seattle, University of WA, and consulting firms
- What answer or problem what is the model attempting to elucidate?
    - The 2018 Conservation Plan Update is designed to build upon, not replace the 2012 BILT Conservation Plan, and refine the strategic initiatives for protection and restoration endeavors. In the 2012 plan, BILT recognized that the supply of conservation lands and habitats on Bainbridge Island was diminishing due to the continued press of development and land use patterns. In 2018, these concerns remain and are heighted due to population growth in the Puget Sound area and on Bainbridge Island. With a sense

of urgency and the need to focus efforts, the 2012 Plan identified two priority ecological systems worthy of our increased attention and action. As BILT worked to update our conservation priorities for now and the future, these priorities remain our focus wildlife networks and shoreline habitats.

- What was the impact or long-term outcome of the model?
    - Many successes from the 2012 modeling process outlined on page 4 of the report and include: acquisition of large sections of land in the core area of the island (fee and easement), expanded protected lands around a nature preserve, shoreline restoration and public/private partnerships for land protection and management.
    - The Conservation Value Index model, described below, is used by the land trust to evaluate land protection opportunities and to strategically identify landowners for outreach and partnership purposes.
- Is the methodology described, and can you reference any publications?
    - They performed a suitability analysis described mainly on page 27 and they called it a Conservation Value Index (CVI). They divided the island into a very fine grid and assigned each grid cell points based on each of the resource values that fall within it. Then the points for each of these resource layers can be added to give a cumulative score for each cell. A place with a high concentration of resources, such as wetlands, streams, rare species' nests, and adjacent to an already-protected area, will show as a cluster of cells with high scores. For a parcel, the cell values could be summed across the area, or an average could be used to compare the value of one vs. another.
    - Descriptions and scores assigned to resource values can be found in the tables starting on page 28.

Part 6: Example ArcHub Site Review

A key task as part of this planning effort is to develop and work within a website platform that provides interactive mapping tools along with community outreach capabilities, document libraries, and the plan executive summary. ESRI's ArcHub platform was chosen as the primary project website. Example ArcHub sites are provided below:

https://www.californianature.ca.gov/ - Looks like a traditional website but it is entirely built in ArcGIS Hub. Multiple layers and data. Great organization, layout, and components.

https://nwpark-cityofhoboken.opendata.arcgis.com/ - Intuitive layout and design - sleek, high-quality graphics, simple in design and engaging. Focused on a single park but could imagine how a similar organizing approach could be applied to a planning process.

https://strategic-plan-ral.opendata.arcgis.com/ - Good example and layout for organizing a hub around a municipal/city strategic plan. Fairly dense but key elements from the comprehensive and other plans are made more accessible to the general public and partners through condensed narrative, graphs, charts, videos and maps.

https://tenminwalk-lynnwoodwa.hub.arcgis.com/ - An example of an "initiative-based" hub. Linked to other sites and resources, give plenty of information on how to get involved, interactive maps, and more.

https://coloradoriverbasin-lincolninstitute.hub.arcgis.com/ - An example of a "data portal" hub that is focused on making geospatial data, maps, and apps accessible to all-in-one location. This hub is based on a topic – the CO River Basin – and water issues. It was created by the Lincoln Institute to make data available from a story map that was previously created called "The Hardest Working River in the West". They got over 40,000 hits on the story map and people asking for the data behind it, so the answer was to create a hub to deliver that data.

https://downtown-energize-kentlands-symgeo.hub.arcgis.com/ - Focused on surveys right up front. Simple, sleek and has good graphics.

https://ddot-urban-forestry-dcgis.hub.arcgis.com/ - A more complicated hub site but shows how it can be used to support a city's tree program. It is a one stop shop for residents to learn about DC tree processes for permitting, planting, cutting down, etc. and includes a lot of multi-media like videos and interactive maps.

Appendix B: Statistically Valid Survey Report

GALLATIN VALLEY SENSITIVE LANDS PROTECTION PLAN

Connecting our Landscape, Heritage, and Future on Common Ground

STATISTICALLY VALID SURVEY REPORT

Prepared by:

Left Brain Concepts, Inc.
Research / Consulting

LOGANSIMPSON

Draft January 19, 2023

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APPENDIX A – SURVEY INSTRUMENT

BACKGROUND

This report presents the findings of a community survey of residents of the Gallatin Valley. As was printed in the introduction of the survey:

> A strong connection between clean water, abundant wildlife, productive agriculture, and cultural heritage has provided a high quality of life for generations. As the Gallatin Valley continues to experience unprecedented growth, a regional approach to protecting sensitive lands can help us develop and live in greater harmony with the natural environment. The City of Bozeman is partnering across a wide variety of government agencies and non-profit organizations to protect important wildlife habitat and critical connections for wildlife and natural systems throughout the Gallatin Valley. The Plan will map sensitive land priorities, make intangible values and natural assets more tangible, and recommend how we can work together to protect the most sensitive resources.

The survey determined residents' reaction to:

- ✓ The importance of a range of land uses and natural resources
- ✓ The importance of sensitive land protection in the Gallatin Valley
- ✓ The types of wildlife that are most important to protect
- ✓ Protecting working farms and ranches
- ✓ The most important things in protecting vegetation
- ✓ The most important things in protecting wetlands and other waters
- ✓ Final thoughts with an open-ended question

The survey was conducted via U.S. Postal Service in November and December 2022. A survey was mailed to a random sample of 3,500 people who own homes in the study area which consisted of Bozeman, Belgrade, Manhattan, Three Forks, and unincorporated Gallatin Valley. People were also given the opportunity to respond electronically via a URL that was printed on the survey. To serve everyone in the study area, instructions were printed in Spanish on the front of the survey as to how people could respond to a Spanish version of the electronic survey. To further serve the community, the electronic survey was made available to all residents in the Gallatin Valley through a link on Project's webpage. While the 163 responses to this survey have been kept separate from the results of the random sample because they are not as defensible as being representative of area residents, the results to this "open link" survey are statistically identical to the results of the random sample survey. Importantly, in the random sample survey, the distribution of completed surveys by area of residence was statistically identical to the actual geographic distribution of residence in the Gallatin Valley.

Completed surveys were returned in a postage-paid envelope to Left Brain Concepts, Inc., a Denver-area market research and consulting firm. The survey was written by senior staff at the City of Bozeman and consultant team at Logan Simpson Design, Inc. Left Brain compiled and analyzed the results and prepared this report.

The introduction asked a head of household, 18 years or older to complete the survey. A total of 406 surveys were completed – 348 via mail and 58 electronically. Because some responses came in after the cut-off date to prepare this report, 395 surveys are included in the results. The maximum margin of error for a sample of 395 is $\pm$ 4.9% at the 95% level of confidence. Results were also analyzed (cross tabbed) by the following variables.

- ✓ Area of residence in the Gallatin Valley study area
- ✓ Length of residence in the Gallatin Valley study area

SUMMARY OF FINDINGS

As evidenced by "Priority of land uses and natural resources" below, Gallatin Valley residents are supportive of the concept of the Sensitive Lands Protection Plan. This is not always a given among residents of an area. Of the nine resources of wildlife, plant communities, waters, agricultural lands, migratory bird habitats, forested areas, native grasslands, and historic and archaeological sites, all but historic and archaeological sites were rated as high or highest priority by 56% or more of area residents.

The primary reasons sensitive land protection is important to residents are water-related - quantity and quality – and wanting to maintain the Valley's wildlife population and biodiversity.

Residents are most interested in protecting deer, elk, moose and other ungulates, native fish and aquatic species, and protecting the connectivity between wildlife habitats.

Regarding working farms and ranches, people are most concerned about local food production, conserving native plants and wildlife habitat, and supporting local livestock production.

For vegetation, water is the most important issue to Valley residents. A distant second is protecting food sources for wildlife. Tied for third is providing shelters for wildlife, pollination, and protecting both native plant communities and forested areas.

For wetlands, riparian areas, lakes streams, and rivers, people's biggest concern is access to clean drinking water. Second is protecting diversity of wildlife habitat. Tied for third are native fish populations, access to water for farm and ranch irrigation, and resiliency to natural disasters and changing climate.

Residents' final thoughts when asked on an open-ended basis are a desire to avoid sprawl into agricultural and natural areas, wanting to maintain a balance between growth and preservation, and concerns about the availability of water. A total of 135 people provided these additional comments, which is 33% of the completed surveys.

KEY FINDINGS

Priority of land uses and natural resources: *The following land uses and natural resources are all important and will be considered within the Gallatin Valley Sensitive Lands Protection Plan. However, the plan will require prioritizing some resources over others. Please consider which of the following provide the most important benefits to the Gallatin Valley or are at the most at risk. Using the scale, assign each category a priority level. (1 = lowest priority, 5 = highest priority).*
Combined responses of 4 and 5 were as follows.

- ✓ Rivers, streams, and wetlands (96%)
- ✓ Wildlife habitat (84%)
- ✓ Linkage areas between wildlife habitats (71%)
- ✓ Forested areas (73%)
- ✓ Agricultural lands (67%)
- ✓ Migratory bird habitat (65%)
- ✓ Native plant communities (62%)
- ✓ Native grasslands (56%)
- ✓ Historic and archaeological sites (including tribal areas) (48%)

Reasons sensitive land protection is important to Gallatin Valley: *Why do you think sensitive land protection is important to the Gallatin Valley?*

- ✓ Protect water quantity and quality for aquatic life and recreation (56%)
- ✓ Maintain the Valley's renowned wildlife populations and biodiversity (52%)
- ✓ Provide water quality and quantity for local residents (51%)
- ✓ Provide water availability for agricultural users (34%)
- ✓ Increase climate resilience to natural disasters (24%)
- ✓ Preserve agricultural heritage (24%)
- ✓ Maintain and create multi-use recreation areas (hiking, biking, horse riding, etc.) (22%)
- ✓ Foster natural carbon sequestration processes and greenhouse gas emission (21%)
- ✓ Preserve landmarks to maintain a sense of place (11%)
- ✓ Provide and improve hunting areas (10%)
- ✓ Preserve recreation opportunities to support the economic benefit of tourism (9%)
- ✓ Provide and improve angler access (8%)

Most important wildlife when protecting habitat: *What types of wildlife do you think is most important to consider when protecting wildlife habitat in the Gallatin Valley?*

- ✓ Deer, elk, moose, and other ungulates (61%)
- ✓ Native fish and aquatic species (57%)
- ✓ Connectivity areas between wildlife habitat (46%)
- ✓ Endangered, threatened, or rare species (grizzly bears, Canada lynx, etc.) (35%)
- ✓ Migratory birds (34%)
- ✓ Raptor nesting areas (33%)
- ✓ Bears (19%)
- ✓ Medium sized mammals (coyotes, foxes, etc.) (15%)
- ✓ Rodents (chipmunks, squirrels, voles, etc.) (5%)

Most important when protecting working farms and ranches: *What do you think is most important to consider when protecting working farms and ranches in the Gallatin Valley?*

- ✓ Supporting local food production (71%)
- ✓ Conserving native plants and wildlife habitat (grasslands, wetlands, riparian areas) (50%)
- ✓ Supporting local livestock production (49%)
- ✓ Supporting crop production for regional and natural needs (45%)
- ✓ Preserving agricultural heritage and sense of place (44%)
- ✓ Facilitating natural carbon sequestration (23%)

Most important when protecting vegetation: *What do you think is most important to consider when protecting vegetation in the Gallatin Valley?*

- ✓ Water quality (64%)
- ✓ Food sources for wildlife (46%)
- ✓ Shelter for wildlife (32%)
- ✓ Pollination (32%)
- ✓ Native plant communities (31%)
- ✓ Forested areas (30%)
- ✓ Grasslands (23%)
- ✓ Tree canopy to prevent heat island effect (14%)
- ✓ Specimen trees (14%)
- ✓ Endangered, threatened, or rare species (Ute ladies-tresses, etc.) (10%)

Most important when protecting wetlands, riparian areas, lakes, streams, and rivers: *What do you think is most important to consider when protecting wetlands, riparian areas, lakes, streams, and rivers in the Gallatin Valley?*

- ✓ Access to clean drinking water (67%)
- ✓ Wildlife habitat diversity (49%)
- ✓ Native fish populations (38%)
- ✓ Access to water for farm and ranch irrigation (38%)
- ✓ Resiliency to natural disasters and changing climate (38%)
- ✓ Aquatic species biodiversity (31%)
- ✓ Recreation opportunities (ex. Fishing, rafting, swimming, etc.) (20%)
- ✓ Food for wildlife (15%)

Additional thoughts (Open Ended Comments): *What additional thoughts would you like to share about sensitive lands protection in the Gallatin Valley?*

- ✓ Avoid sprawl into agricultural and natural areas (33%)
- ✓ Maintain a balance between growth and preservation (25%)
- ✓ Water availability (20%)
- ✓ Control growth in Gallatin Valley (16%)
- ✓ Slow development of subdivisions (16%)
- ✓ Riparian areas need to be protected from livestock and development (13%)
- ✓ Need more conservation easements (7%)
- ✓ Need water conservation measures in households (6%)
- ✓ Protect wildlife corridors (6%)
- ✓ Protect farm and ranch land (5%)
- ✓ Restrict or prohibit further land development outside Bozeman city limits (4%)
- ✓ Protect water rights (3%)
- ✓ Protect land and water from pesticide use (2%)
- ✓ Plant low-water yards and plants (2%)

PRIORITY OF LAND USES AND NATURAL RESOURCES

Question: The following land uses and natural resources are all important and will be considered within the Gallatin Valley Sensitive Lands Protection Plan. However, the plan will require prioritizing some resources over others. Please consider which of the following provide the most important benefits to the Gallatin Valley or are at the most at risk. Using the scale, assign each category a priority level. (1 = lowest priority, 5 = highest priority)

Combining responses of 4 and 5, Gallatin Valley residents rated the importance of natural resources as follows.

- ✓ Rivers, streams, and wetlands (96%)
- ✓ Wildlife habitat (84%)
- ✓ Forested areas (73%)
- ✓ Linkage areas between wildlife habitats (71%)
- ✓ Agricultural lands (67%)
- ✓ Migratory bird habitat (65%)
- ✓ Native plant communities (62%)
- ✓ Native grasslands (56%)
- ✓ Historic and archaeological sites (including tribal areas) (48%)

Differences by demographics

Agricultural lands
Residents of Belgrade, Manhattan, and Three Forks gave almost twice the ratings of 5 than residents of Bozeman (62% vs. 32%).

There were no other differences by demographics therefore additional tables are not presented for each land use cross tabbed by area of residence and by length of residence in the Valley.

PRIORITY OF LAND USES AND NATURAL RESOURCES

	5 = Highest priority	4	3	2	1 = Lowest priority
Rivers, streams, and wetlands	80%	16%	2%	1%	1%
Wildlife habitat	57%	27%	11%	3%	2%
Linkage areas between wildlife habitats	47%	24%	18%	7%	4%
Agricultural lands	43%	24%	19%	6%	8%
Forested areas	37%	36%	21%	4%	2%
Migratory bird habitat	34%	31%	24%	7%	4%
Native plant communities	28%	34%	24%	10%	4%
Native grasslands	28%	28%	30%	10%	4%
Historic and archaeological sites (including tribal areas)	22%	26%	28%	14%	10%

REASONS SENSITIVE LAND PROTECTION IS IMPORTANT TO GALLATIN VALLEY

Question: Why do you think sensitive land protection is important to the Gallatin Valley? (Select up to 3)

From the list of twelve issues posed to area residents, results were as follows.

- ✓ Protect water quantity and quality for aquatic life and recreation (56%)
- ✓ Maintain the Valley's renowned wildlife populations and biodiversity (52%)
- ✓ Provide water quality and quantity for local residents (51%)
- ✓ Provide water availability for agricultural users (34%)
- ✓ Increase climate resilience to natural disasters (24%)
- ✓ Preserve agricultural heritage (24%)
- ✓ Maintain and create multi-use recreation areas (hiking, biking, horse riding, etc.) (22%)
- ✓ Foster natural carbon sequestration processes and greenhouse gas emission reductions (21%)
- ✓ Preserve landmarks to maintain a sense of place (11%)
- ✓ Provide and improve hunting areas (10%)
- ✓ Preserve recreation opportunities to support the economic benefit of tourism (9%)
- ✓ Provide and improve angler access (8%)

Differences by demographics

<u>Provide water availability for agricultural users</u>
Residents of Belgrade, Manhattan, and Three Forks noted this more than twice as much as Bozeman residents (51% vs. 24%)

<u>Increase climate resilience to natural disasters</u>
Bozeman residents cited this almost three times more than residents of Belgrade, Manhattan, and Three Forks (33% vs. 13%)

<u>Preserve agricultural heritage</u>
People in unincorporated areas reported this twice as much as Bozeman residents (33% vs. 16%)

Respondents who have lived in the Gallatin Valley for 20+ years cited this more than twice as much as people who have lived in the Valley for less than 20 years (30% vs. 13%)

REASONS SENSITIVE LAND PROTECTION IS IMPORTANT IN GALLATIN VALLEY						
		Area of residence			Years in Gallatin Valley	
	Total	Bozeman	Belgrade, Manhattan, Three Forks	Unincorp.	< 20 years	20+ years
Protect water quantity and quality for aquatic life and recreation	56%	60%	49%	57%	58%	56%
Maintain the Valley's renowned wildlife populations and biodiversity	52%	57%	51%	49%	59%	48%
Provide water quality and quantity for local residents	51%	52%	58%	47%	52%	51%
Provide water availability for agricultural users	34%	24%	51%	37%	27%	37%
Increase climate resilience to natural disasters	24%	33%	13%	19%	26%	24%
Preserve agricultural heritage	24%	16%	24%	33%	13%	30%
Maintain and create multi-use recreation areas (hiking, biking, horse riding, etc.)	22%	26%	25%	14%	23%	21%
Foster natural carbon sequestration processes and greenhouse gas emission reductions	21%	25%	15%	22%	20%	23%
Preserve landmarks to maintain a sense of place	11%	12%	13%	9%	13%	10%
Provide and improve hunting areas	10%	7%	13%	13%	7%	12%
Preserve recreation opportunities to support the economic benefit of tourism	9%	11%	7%	5%	8%	9%
Provide and improve angler access	8%	6%	15%	6%	8%	7%

MOST IMPORTANT WILDLIFE WHEN PROTECTING HABITAT

Question: What types of wildlife do you think is most important to consider when protecting wildlife habitat in the Gallatin Valley? (Select up to 3)

From eight types of wildlife and one wildlife-related issue posed, Gallatin Valley residents' responses totaled the following.

- ✓ Deer, elk, moose, and other ungulates (61%)
- ✓ Native fish and aquatic species (57%)
- ✓ Connectivity areas between wildlife habitat (46%)
- ✓ Endangered, threatened, or rare species (grizzly bears, Canada lynx, etc.) (35%)
- ✓ Migratory birds (34%)
- ✓ Raptor nesting areas (33%)
- ✓ Bears (19%)
- ✓ Medium sized mammals (coyotes, foxes, etc.) (15%)
- ✓ Rodents (chipmunks, squirrels, voles, etc.) (5%)

Differences by demographics

Deer, elk, moose, and other ungulates
Protecting this wildlife is more important to residents of Belgrade, Manhattan, and Three Forks than Bozeman residents (74% vs. 55%)

Endangered, threatened, or rare species (grizzly bears, Canada lynx, etc.)
Protecting these species are more important to residents of Bozeman than people in other areas in the Gallatin Valley (47% Bozeman, 23% Belgrade, Manhattan, Three Forks, 26% unincorporated areas)

Protecting these species is more important to people who have lived in the Gallatin Valley for less than 20 years than those who have resided in the Valley for 20+ years (46% vs. 29%)

MOST IMPORTANT WILDLIFE WHEN PROTECTING HABITAT						
		Area of residence			Years in Gallatin Valley	
	Total	Bozeman	Belgrade, Manhattan, Three Forks	Unincorp.	< 20 years	20+ years
Deer, elk, moose, and other ungulates	61%	55%	74%	62%	56%	63%
Native fish and aquatic species	57%	56%	62%	56%	60%	55%
Connectivity areas between wildlife habitat	46%	51%	32%	46%	48%	46%
Endangered, threatened, or rare species (grizzly bears, Canada lynx, etc.)	35%	47%	23%	26%	46%	29%
Migratory birds	34%	33%	43%	31%	34%	33%
Raptor nesting areas	33%	28%	34%	40%	32%	35%
Bears	19%	24%	17%	13%	19%	20%
Medium sized mammals (coyotes, foxes, etc.)	15%	15%	23%	12%	16%	16%
Rodents (chipmunks, squirrels, voles, etc.)	5%	5%	8%	5%	7%	5%

MOST IMPORTANT WHEN PROTECTING WORKING FARMS AND RANCHES

Question: What do you think is most important to consider when protecting working farms and ranches in the Gallatin Valley? (Select up to 3)

Gallatin Valley residents noted the following concerning protecting working farms and ranches.

- ✓ Supporting local food production (71%)
- ✓ Conserving native plants and wildlife habitat - grasslands, wetlands, riparian areas (50%)
- ✓ Supporting local livestock production (49%)
- ✓ Supporting crop production for regional and natural needs (45%)
- ✓ Preserving agricultural heritage and sense of place (44%)
- ✓ Facilitating natural carbon sequestration (23%)

Differences by demographics

Supporting local livestock production
This is more important to residents of Belgrade, Manhattan, and Three Forks mentioned than Bozeman residents (73% vs. 44%)

Facilitating natural carbon sequestration
This is a bigger issue to residents of Bozeman than residents of Belgrade, Manhattan, and Three Forks (31% vs. 13%)

MOST IMPORTANT WHEN PROTECTING WORKING FARMS AND RANCHES						
		Area of residence			Years in Gallatin Valley	
	Total	Bozeman	Belgrade, Manhattan, Three Forks	Unincorp.	< 20 years	20+ years
Supporting local food production	71%	75%	77%	60%	74%	68%
Conserving native plants and wildlife habitat (grasslands, wetlands, riparian areas)	50%	56%	45%	46%	48%	52%
Supporting local livestock production	49%	44%	73%	46%	51%	47%
Supporting crop production for regional and natural needs	45%	37%	54%	50%	43%	46%
Preserving agricultural heritage and sense of place	44%	40%	36%	54%	39%	47%
Facilitating natural carbon sequestration	23%	31%	13%	19%	24%	23%
Providing scenic views	12%	11%	14%	11%	14%	10%

MOST IMPORTANT WHEN PROTECTING VEGETATION

Question: What do you think is most important to consider when protecting vegetation in the Gallatin Valley? (Select up to 3)

Responses totaled the following regarding protecting vegetation in the Gallatin Valley.

- ✓ Water quality (64%)
- ✓ Food sources for wildlife (46%)
- ✓ Shelter for wildlife (32%)
- ✓ Pollination (32%)
- ✓ Native plant communities (31%)
- ✓ Forested areas (30%)
- ✓ Grasslands (23%)
- ✓ Tree canopy to prevent heat island effect (14%)
- ✓ Specimen trees (i.e., large cottonwoods following streams/rivers, isolated stands of pine, unique species, etc.) (14%)
- ✓ Endangered, threatened, or rare species (Ute ladies-tresses, etc.) (10%)

Differences by demographics

Native plant communities
This is more important to residents of Bozeman than residents of Belgrade, Manhattan, and Three Forks (39% vs. 18%)

Grasslands
Protecting grasslands is more important to residents of Belgrade, Manhattan, and Three Forks than Bozeman residents (34% vs. 16%)

MOST IMPORTANT WHEN PROTECTING VEGETATION						
		Area of residence			Years in Gallatin Valley	
	Total	Bozeman	Belgrade, Manhattan, Three Forks	Unincorp.	< 20 years	20+ years
Water quality	64%	60%	75%	64%	57%	68%
Food sources for wildlife	46%	48%	59%	41%	52%	44%
Shelter for wildlife	32%	30%	36%	33%	31%	33%
Pollination	32%	32%	39%	29%	35%	31%
Native plant communities	31%	39%	18%	28%	34%	30%
Forested areas	30%	28%	38%	31%	30%	30%
Grasslands	23%	16%	34%	28%	21%	24%
Tree canopy to prevent heat island effect	14%	19%	13%	8%	13%	15%
Specimen trees (i.e., large cottonwoods following streams/rivers, isolated stands of pine, unique species, etc.)	14%	15%	14%	11%	11%	15%
Carbon sequestration	11%	13%	7%	13%	13%	11%
Endangered, threatened, or rare species (Ute ladies-tresses, etc.)	10%	12%	9%	8%	15%	7%

MOST IMPORTANT WHEN PROTECTING WETLANDS, RIPARIAN AREAS, LAKES, STREAMS, AND RIVERS

Question: What do you think is most important to consider when protecting wetlands, riparian areas, lakes, streams, and rivers in the Gallatin Valley? (Select up to 3)

When asked to note what is most important when protecting wetlands, riparian areas, lakes, streams, and rivers in the Gallatin Valley, results were as follows.

- ✓ Access to clean drinking water (67%)
- ✓ Wildlife habitat diversity (49%)
- ✓ Native fish populations (38%)
- ✓ Access to water for farm and ranch irrigation (38%)
- ✓ Resiliency to natural disasters and changing climate (ex. Wetland areas can mitigate the impacts of flooding) (38%)
- ✓ Aquatic species biodiversity (31%)
- ✓ Recreation opportunities (ex. Fishing, rafting, swimming, etc.) (20%)
- ✓ Food for wildlife (15%)

Differences by demographics

Access to water for farm and ranch irrigation
As would be expected, this was more important to residents of Belgrade, Manhattan, and Three Forks than Bozeman residents (53% vs. 28%)

MOST IMPORTANT WHEN PROTECTING WETLANDS, RIPARIAN AREAS, LAKES, STREAMS, AND RIVERS						
		Area of residence			Years in Gallatin Valley	
	Total	Bozeman	Belgrade, Manhattan, Three Forks	Unincorp.	< 20 years	20+ years
Access to clean drinking water	67%	69%	73%	65%	62%	72%
Wildlife habitat diversity	49%	51%	45%	51%	54%	47%
Native fish populations	38%	41%	45%	30%	40%	36%
Access to water for farm and ranch irrigation	38%	28%	53%	44%	32%	42%
Resiliency to natural disasters and changing climate, (ex. wetland areas can mitigate the impacts of flooding)	38%	48%	31%	30%	42%	37%
Aquatic species biodiversity	31%	31%	22%	35%	34%	29%
Recreation opportunities (ex. fishing, rafting, swimming, etc.)	20%	19%	27%	19%	23%	19%
Food for wildlife	15%	15%	24%	12%	19%	13%

ADDITIONAL THOUGHTS

The survey asked for respondents to share any additional thoughts. The open-ended responses were summarized into the categories below. A total of 135 people provided these additional comments, which is 33% of the completed surveys.

Question: What additional thoughts would you like to share about sensitive lands protection in the Gallatin Valley?

Responses to this open-ended question were as follows.

- ✓ Avoid sprawl into agricultural & natural areas (33%)
- ✓ Maintain a balance between growth and preservation (25%)
- ✓ Water availability is a major concern (20%)
- ✓ Control growth in Gallatin Valley (16%)
- ✓ Slow development of subdivisions (16%)
- ✓ Riparian areas need to be protected from livestock & development (13%)
- ✓ Need more conservation easements (7%)
- ✓ Need water conservation measures in households (6%)
- ✓ Protect wildlife corridors (6%)
- ✓ Protect farm and ranch land (5%)
- ✓ Restrict or prohibit further land development outside Bozeman city limits (4%)
- ✓ Protect water rights (3%)
- ✓ Protect land and water from pesticide use (2%)
- ✓ Plant low-water yards & plants (2%)

ADDITIONAL THOUGHTS						
		Area of residence			Years in Gallatin Valley	
	Total	Bozeman	Belgrade, Manhattan, Three Forks	Unincorp.	< 20 years	20+ years
Avoid sprawl into agricultural & natural areas	33%	38%	20%	34%	34%	35%
Maintain a balance between growth and preservation	25%	22%	33%	27%	39%	20%
Water availability is a major concern	20%	18%	7%	27%	20%	21%
Control growth in Gallatin Valley	16%	16%	20%	15%	9%	20%
Slow the development of subdivisions	16%	16%	7%	17%	16%	16%
Riparian areas need to be protected from livestock & development	13%	18%	7%	10%	11%	14%
Need more conservation easements	7%	11%	7%	5%	2%	10%
Need water conservation measures in households	6%	9%	7%	3%	9%	5%
Protect wildlife corridors	6%	5%	13%	5%	9%	5%
Protect farm and ranch land	5%	5%	-	5%	5%	5%
Restrict or prohibit further land development outside Bozeman city limits	4%	55	7%	2%	2%	5%
Protect water rights	3%	5%	-	2%	5%	2%
Protect land and water from pesticide use	2%	4%	-	2%	5%	-
Plant low-water yards & plants	2%	2%	-	3%	2%	2%
Maintain water quality	2%	-	-	5%	5%	-

DEMOGRAPHICS

The following demographic questions are optional but help us better understand who we are hearing from and meet our goals of reaching out to a representative sample of the population.

Which of the following areas best describes where your property resides within the Gallatin Valley Study Area? (Select one)

How long have you lived in the Gallatin Valley? (Select one)
What is your relationship to the Gallatin Valley? (Check all that apply)
What is your age?
Which range best describes your household income? (Select one)
Are you Hispanic or Latino? (Select one)
How would you describe your race? (Check all that apply)

The distribution of completed surveys by area of residence was statistically identical to the actual geographic distribution of residence in the Gallatin Valley study area.

Differences by demographics

Length of residence in the Gallatin Valley
As would be expected, a higher percentage of residents in unincorporated areas have lived in the Valley 20+ years than residents of Bozeman (73% vs. 52%)

People who have lived in the Gallatin Valley for less than 20 years noted household incomes of over $100,000 more than residents of 20+ years reported (49% vs. 26%)

DEMOGRAPHICS	
Area of residence	**Survey Respondents**
City of Bozeman	50%
Town of Belgrade	10%
Town of Manhattan	3%
Town of Three Forks	2%
Unincorporated area	35%
Length of residence	**Survey Respondents**
0-1 year	1%
2-5 years	11%
6-10 years	12%
11-15 years	8%
16-20 years	7%
20+	61%
Relation to Valley	**Survey Respondents**
Full time resident	85%
Retired	23%
Work full time	14%
Business owner	12%
Part time resident	7%
Own short-term rental property	2%
Work seasonally	1%

DEMOGRAPHICS	
Age	**Survey Respondents**
Under 18	-
18-24	1%
25-34	7%
35-44	13%
45-54	12%
Over 55	67%
Income	**Survey Respondents**
< $20,000	2%
$20K - $34,999	7%
$35K - $49,999	8%
$50K - $74,999	19%
$75K - $99,999	21%
Over $100K	43%
Race	**Survey Respondents**
White	97%
American Indian or Alaska Native	1%
Asian or Asian American	1%
Some other race	1%

Hispanic?	**Survey Respondents**
Yes	1%
No	99%

Appendix A

Survey Instrument

GALLATIN VALLEY
SENSITIVE LANDS
PROTECTION PLAN

Connecting our Landscape, Heritage, and Future on Common Ground

STATISTICALLY VALID SURVEY

Comparta sus comentarios sobre la vida silvestre, los espacios abiertos y la agricultura en el Valle de Gallatin. ¡Participe en nuestro cuestionario en español! https://www.surveymonkey.com/r/GallatinVEspanol

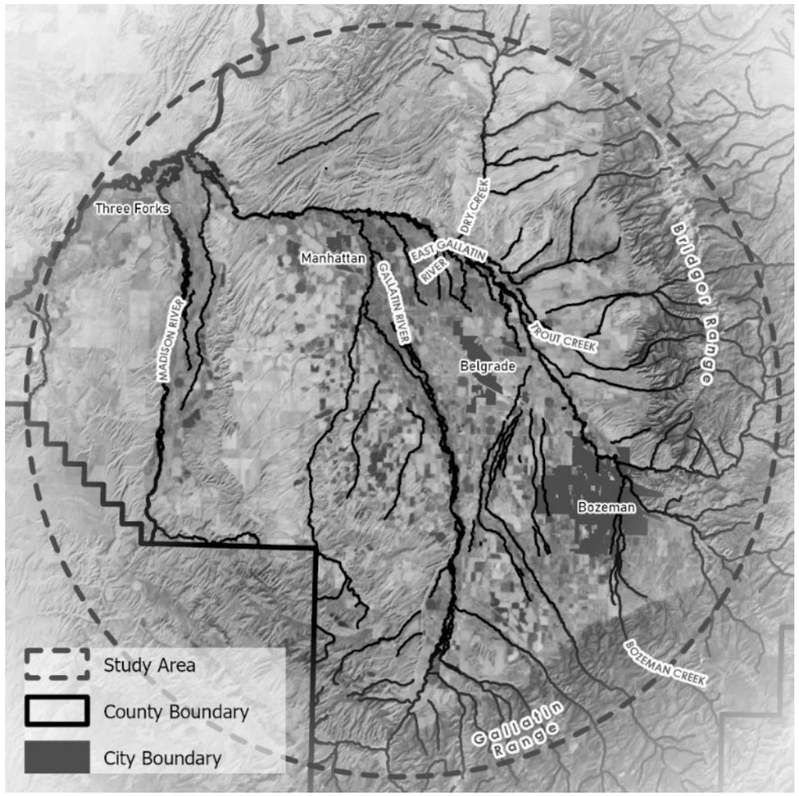
Background
A strong connection between clean water, abundant wildlife, productive agriculture, and cultural heritage has provided a high quality of life for generations. As the Gallatin Valley continues to experience unprecedented growth, a regional approach to protecting sensitive lands can help us develop and live in greater harmony with the natural environment. The City of Bozeman is partnering across a wide variety of government agencies and non-profit organizations to protect important wildlife habitat and critical connections for wildlife and natural systems throughout the Gallatin Valley. The Plan will map sensitive land priorities, make intangible values and natural assets more tangible, and recommend how we can work together to protect the most sensitive resources.

We are looking for YOUR feedback to learn what the residents of Gallatin Valley value most when it comes to identifying and protecting sensitive lands. Your feedback will be used to help prioritize the most critical aspects of the Gallatin Valley Sensitive Lands Protection Plan. Help chart the future by sharing your vision and values for the Gallatin Valley.

This survey should be completed by a head of household who is 18 years old or older and responds for the entire household. **Please return the survey via the self-addressed, postage-paid envelope by November 21, 2022.**

You may choose to respond online instead at https://www.surveymonkey.com/r/GallatinV. All answers will be collected by an independent third-party and remain anonymous. This survey will take about 10 minutes to complete.

Study Area: This map displays the geographic scope of the Gallatin Valley, or the general area that will be analyzed for sensitive lands opportunities. The circular boundary is not a hard line but a way to focus analysis and discussion of plan recommendations. When answering the survey please keep the extent of the study area in mind.



1. **The following land uses and natural resources are all important and will be considered within the Gallatin Valley Sensitive Lands Protection Plan. However, the plan will require prioritizing some resources over others. Please consider which of the following provide the most important benefits to the Gallatin Valley or are at the most at risk. Using the scale, assign each category a priority level.**

	Highest Priority 5	**4**	**3**	**2**	**Lowest Priority 1**
Wildlife Habitat	5	4	3	2	1
Native Plant Communities	5	4	3	2	1
Linkage areas between Wildlife Habitats	5	4	3	2	1
Rivers, Streams, and Wetlands	5	4	3	2	1
Agricultural Lands	5	4	3	2	1
Migratory Bird Habitat	5	4	3	2	1
Forested Areas	5	4	3	2	1
Native Grasslands	5	4	3	2	1
Historic and Archaeological Sites (including tribal areas)	5	4	3	2	1

2. **Why do you think sensitive land protection is important to the Gallatin Valley?** *(Select up to 3)*

- ❑ Maintain the Valley's renowned wildlife populations and biodiversity
- ❑ Protect water quantity and quality for aquatic life and recreation
- ❑ Provide water availability for agricultural users
- ❑ Provide water quality and quantity for local residents
- ❑ Preserve agricultural heritage
- ❑ Maintain and create multi-use recreation areas (hiking, biking, horse riding, etc.)
- ❑ Preserve landmarks to maintain a sense of place
- ❑ Increase climate resilience to natural disasters
- ❑ Foster natural carbon sequestration processes and greenhouse gas emission reductions
- ❑ Preserve recreation opportunities to support the economic benefits of tourism
- ❑ Provide and improve hunting access
- ❑ Provide and improve angler access

3. **What <u>types of wildlife</u> do you think is most important to consider when protecting wildlife habitat in the Gallatin Valley?** *(Select up to 3)*

- ❑ Deer, elk, moose, and other ungulates
- ❑ Bears
- ❑ Raptor nesting areas
- ❑ Migratory birds
- ❑ Native fish and aquatic species
- ❑ Rodents (chipmunks, squirrels, voles, etc.)
- ❑ Medium sized mammals (coyotes, foxes, etc.)
- ❑ Endangered, threatened, or rare species (grizzly bears, Canada lynx, etc.)
- ❑ Connectivity areas between wildlife habitat
- ❑ Other (please provide): _____

4. **What do you think is most important to consider when protecting <u>working farms and ranches</u> in the Gallatin Valley?** *(Select up to 3)*

- ❑ Preserving agricultural heritage and sense of place
- ❑ Supporting local food production
- ❑ Supporting local livestock production
- ❑ Supporting crop production for regional and national needs
- ❑ Conserving native plants and wildlife habitat (grasslands, wetlands, riparian areas)
- ❑ Providing scenic views
- ❑ Facilitating natural carbon sequestration
- ❑ Other (please provide): _____

5. **What do you think is most important to consider when protecting <u>vegetation</u> in the Gallatin Valley?** *(Select up to 3)*

- ❑ Food sources for wildlife
- ❑ Shelter for wildlife
- ❑ Pollination
- ❑ Native plant communities
- ❑ Tree canopy to prevent heat island effect
- ❑ Water quality
- ❑ Carbon sequestration
- ❑ Specimen trees (i.e., large cottonwoods following streams/rivers, isolated stands of pine, unique species, etc.)
- ❑ Endangered, threatened, or rare species (Ute ladies-tresses, etc.)
- ❑ Grasslands
- ❑ Forested areas
- ❑ Other (please provide): _____

6. **What do you think is the most important to consider when protecting <u>wetlands, riparian areas, lakes, streams, and rivers</u> in the Gallatin Valley?** *(Select up to 3)*

- ❑ Access to clean drinking water
- ❑ Native fish populations
- ❑ Aquatic species biodiversity
- ❑ Wildlife habitat diversity
- ❑ Food for wildlife
- ❑ Access to water for farm and ranch irrigation
- ❑ Resiliency to natural disasters and changing climate (ex. wetland areas can mitigate the impacts of flooding)
- ❑ Recreation opportunities (ex. fishing, rafting, swimming, etc.)
- ❑ Other (please provide): _____

7. Final Question

What additional thoughts would you like to share about sensitive lands protection in the Gallatin Valley?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Demographics

The following demographic questions are optional but help us better understand who we are hearing from and meet our goals of reaching out to a representative sample of the population.

1. **Which of the following areas best describes where your property resides within the Gallatin Valley Study Area?** *(Select one)*
   - ❑ City of Bozeman
   - ❑ Town of Belgrade
   - ❑ Town of Manhattan
   - ❑ Town of Three Forks
   - ❑ Unincorporated area within the Gallatin Valley Study Area

2. **How long have you lived in the Gallatin Valley?** *(Select one)*
   - ❑ 0-1 year
   - ❑ 2-5 years
   - ❑ 6-10 years
   - ❑ 11-15 years
   - ❑ 16-20 years
   - ❑ 20+ years

3. **What is your relationship to the Gallatin Valley?** *(Check all that apply)*
   - ❑ Full Time Resident
   - ❑ Part Time Resident
   - ❑ Business Owner
   - ❑ Work Full Time
   - ❑ Work Seasonally
   - ❑ Retired
   - ❑ Own short-term rental property

4. **What is your age?**
   - ❑ Under 18
   - ❑ 18-24
   - ❑ 25-34
   - ❑ 35-44
   - ❑ 45-54
   - ❑ Over 55
   - ❑ Prefer not to answer

4. **Which range best describes your household income?** *(Select one)*
   - ❑ Less than $20,000
   - ❑ $20,000 to $34,999
   - ❑ $35,000 to $49,999
   - ❑ $50,000 to $74,999
   - ❑ $75,000 to $99,999
   - ❑ Over $100,000
   - ❑ Prefer not to answer

5. **Are you Hispanic or Latino?** *(Select one)*
   - ❑ Yes
   - ❑ No
   - ❑ Prefer not to answer

6. **How would you describe your race?** *(Check all that apply)*
   - ❑ American Indian or Alaska Native
   - ❑ Asian or Asian American (ex: Chinese, Asian Indian, Korean, Japanese)
   - ❑ Black or African American
   - ❑ White
   - ❑ Native Hawaiian or Pacific Islander
   - ❑ Some other race (write in) _____
   - ❑ Prefer not to answer

Thank you!

Thank you for taking the time to participate in the Gallatin Valley Sensitive Lands Protection Plan Survey. To learn more about the study and see how the survey results will be used to inform the study, visit **gallatinvalleyplan.bozeman.net**

APPENDICES

Appendix C: Detailed Data Summary and Model Design Process

Descriptions of Data Sources Considered but Excluded from the Model Analysis

Descriptions of Data Sources Considered but Excluded from the Model Analysis

Layer	Source	Definition	Reason for Exclusion	Link
Plant Observations	Montana Natural Heritage Program	This layer contains points of observation of specific plant species provided by the public	The data is not robust enough to include and since plants are not mobile and individual plants will not represent the entire vegetation community, this layer doesn't represent plant habitat in a meaningful way,	https://mtnhp.org/models/
Animal Observations	Montana Natural Heritage Program	This layer contains points of observation of specific animal species provided by the public	This data is already accounted for in the included biodiversity layers from MNHP.	https://mtnhp.org/models/
Tribal Nations in Montana	Montana State Library	Tribal Nations Reservation Boundaries in Montana	There are no Tribal Nation Reservation Boundaries in the Study Area.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={341205DA-7668-4119-9D21-0D1C8AFCF5F1}
Ungulate Migrations of the West	U.S. Geological Survey	Authoritative map of migration corridors	Not in Study Area.	https://www.usgs.gov/publications/ungulate-migrations-western-united-states-volume-3
Potential grizzly bear passage along major road corridors in northwest Montana	Peck et al., 2016	Point features 300 m apart identifying indices for potential passage rate at intersections with major transportation corridors for grizzly movements between GYE and NCDE based on Randomized Shortest Path	Did not receive access to data, likely out of Study Area.	Not received
Custer Gallatin National Forest Connectivity Models	Center for Large Landscape Conservation	Variety of species agnostic connectivity models	Not appropriate for decision making at the county-scale because of the large pixel size.	https://drive.google.com/drive/folders/1rJaWUdGExY9jDcFMzwJZgVHep4X4A9QW?usp=sharing
Valley Bottom Riparian Corridors	US Forest Service	Map of riparian valley bottoms from Western Threat Assessment	Riparian areas already represented in model.	https://davidtheobald8.users.earthengine.app/view/riparianthreatassessment
Riparian climate corridors	Krosby et al., 2018	Estimated value of riparian corridors for facilitating climate-induced species range shifts	Does not include Montana.	Identifying riparian climate corridors to inform climate adaptation planning I PLOS ONE
Surface water and mesic vegetation in the high divide	Kolarik et al., 2018.	Open water, wetland/riparian veg at 10m resolution	Riparian areas already represented in model.	https://www.sciencedirect.com/science/article/pii/S1470160X23001073
Wetland evaluation tool	Intermountain West	Open water, wetland/riparian veg at 30m resolution	Wetlands already represented in model.	https://iwjv.org/solution-based-science/wet/
Montana SWAP Terrestrial Focus Areas	Montana Fish, Wildlife & Parks	Areas identified as priority areas for terrestrial conservation efforts within the Montana State Wildlife Action Plan (SWAP).	Too large scale.	https://mslservices.mt.gov/geographic_information/data/datalist/datalist_Details.aspx?did=%7B61a15e30-2bf7-11e5-a2cb-0800200c9a66%7D

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Descriptions of Data Sources Considered but Excluded from the Model Analysis

Layer	Source	Definition	Reason for Exclusion	Link
Climate-Informed Wildlife Corridors	Rosa et al.	Represents climate-informed wildlife corridors across the contiguous U.S.	Too large scale.	https://osf.io/jksyx/
Elk migration	Idaho Fish and Game	Mapped mule deer, elk, and pronghorn migration	Not in Study Area.	https://www.arcgis.com/home/item.html?id=e2e2518bf3df4ff381caa7cf7bb383fb
Antelope	U.S. Geological Survey	Authoritative map of migration corridors	Not in Study Area.	https://pubs.usgs.gov/sir/2022/5088/sir20225088.pdf
Habitat fragmentation and degradation	Silvis Lab - University of Wisconsin - Madison	Block Level Housing Change	Already addressed in threats overlay.	http://silvis.forest.wisc.edu/data/housing-block-change-2020/
Examining Local and Regional Ecological Connectivity throughout North America (Species Agnostic)	Belote et al.	Models connectivity at different spatial scales, is species agnostic, does not depend on locations of core areas, and is not constrained to national borders. The south west area of Montana where Gallatin County is located, stands out as important at the continental scale.	Too large scale.	https://link.springer.com/article/10.1007/s10980-022-01530-9
Identifying Corridors among Large Protected Areas in the United States	Belote et al.	Models continental scale connectivity between protected areas, such as National Parks.	Too large scale.	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0154223
Analyzing Wildlife Movement Corridors in Montana Using GIS	American Wildlands (Lance Craighead)	Landscape routes offering the best chance of success for wildlife moving among the three large core protected areas in the Northern Rockies.	Shapefiles not available.	https://proceedings.esri.com/library/userconf/proc97/proc97/to150/pap116/p116.htm
National Register of Historic Places (Site, Building, District)	National Park Service (2020)	Properties that are listed by NPS. If a structure is listed, and not the property, apply it to the entire parcel.	There are only a few places located in the Study Area. A few are located in urban areas within the Bozeman city limits. There was one very small site located in the northwestern area of the Study Area, but was located on already conserved lands.	https://www.nps.gov/subjects/nationalregister/database-research.htm
Vacant, Undeveloped, and Rural Farmstead Properties	Montana Department of Revenue (2023)	Includes taxable and tax-exempt parcels for Gallatin County. Dataset includes data for most of Montana. This layer indicates areas that are coded for agriculture or are coded as vacant, but according to expert review, did not accurately depict lands important to agriculture.	Did not provide an accurate depiction of non-irrigated agricultural land according to the Working Group.	http://ftpgeoinfo.msl.mt.gov/Data/Spatial/MSDI/Cadastral/Parcels
Noxious Weeds Invasion Risk	Montana Natural Heritage Program (2022)	Noxious weed areas can encroach on important sensitive lands and might require additional attention to protection	This layer is redundant because the human disturbance index considers introduced vegetation as a part of its calculation and the highest values for the two layers are almost in identical areas.	Provided by MNHP through email correspondence
ROaDS app wildlife and carcass data	Center for Large Landscape Conservation	This layer contains point data for live and dead wildlife observations along roads by citizen scientists recorded on a smartphone app.	This data is incomplete for the Gallatin Valley. Primarily includes data along South 191.	https://largelandscapes.maps.arcgis.com/apps/dashboards/3be6bd7ab3f74eb8977e60364ff9ea29
Current Land Use	Montana State Library	Describes the human activities currently set for a given area.	Non-Irrigated and Irrigated Acres (Revenue Final Land Unit (FLU) Classification) is a more accurate source for agricultural land use.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/DataList_SearchResults.aspx?textsrch=vacant&contentype=All
Future Land Use	City of Bozeman	Describes the human activities predicted to be set for a given area.	Provides background data but not applicable to sensitive lands model themes.	Received through email correspondence with the City of Bozeman

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Descriptions of Data Sources Considered but Excluded from the Model Analysis

Layer	Source	Definition	Reason for Exclusion	Link
Zoning	City of Bozeman	Official land use zoning for the City of Bozeman.	Provides background data but not applicable to sensitive lands model themes.	Received through email correspondence with the City of Bozeman and Gallatin County
Parcels with Assessors Data (considered as a source for Irrigated Acres)	Montana State Library (2022)	Maps the taxable parcels and tax-exempt parcels for most of Montana. Montana tax parcel data includes attributes for Irrigated Acres, Farmsite Acres, Wildhay Acres, Continuous Crop Acres, Fallow Acres, Grazing Acres by Parcel (Montana Cadastral Framework).	This study is not focusing on data at the parcel level. Irrigated agricultural lands are better represented by the Revenue Final Land Unit (FLU) Classification data, which is also updated more frequently.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={b2b3c906-8c40-4a9f-980e-48680a23c165}
Building Footprints	City of Bozeman	Shows the shape of buildings and development within Bozeman, Montana.	This layer was used to approximate vacant lots, but the Non-Irrigated and Irrigated Acres (Revenue Final Land Unit (FLU) Classification) layer is a better representation of agricultural land than this approximation.	Received through email correspondence with the City of Bozeman
Recreational Trails	Montana State Library, City of Bozeman	This layer indicates current alignments for future recreation pathways and trails.	Provides background data but not applicable to sensitive lands model themes.	Received through email correspondence with the City of Bozeman
Planned Future Pathways/Trails	City of Bozeman	This layer indicates planned alignments for future recreation pathways and trails.	Provides background data but not applicable to sensitive lands model themes.	Received through email correspondence with the City of Bozeman
Population and employment forecasts and Transportation Analysis Zones (TAZs) Boundaries	City of Bozeman	Investigated layers to identify population forecasts.	Provides background data but not applicable to sensitive lands model themes.	Received through email correspondence with the City of Bozeman
Centennial Farms	Montana State Library	Data indicating where historic farms may be located.	Data not available.	Not available.
Previous Burn Areas	Monitoring Trends in Burn Severity	Historic and recent burn areas boundaries.	Provides background data but not applicable to sensitive lands model themes.	https://www.mtbs.gov/direct-download
Oil and Gas	Montana Board of Oil & Gas Conservation	Provides location and status of oil and gas wells.	Not applicable to sensitive lands model themes. Included in threats layers.	https://bogapps.dnrc.mt.gov/dataminer/MontanaMap.aspx
Landslides	Montana Technological University	Identifies landslide areas across the State of Montana to better understand spatial distribution and causes of ground failure to help mitigate against landslide hazards. New and ongoing deployment of Light Detection and Ranging (LiDAR) techniques provides means to create high-resolution imagery and remove vegetation cover to identify landslide processes.	Not applicable to sensitive lands model themes.	http://www.mbmg.mtech.edu/MontanaGeology/geohazards/landslides/main.asp
Building Permit Data (past 5 years, new construction and improvements), residential, commercial, and industrial	Gallatin County	Building permits issue for a range of new construction and improvements intended to track where new developments may be arising in the future.	Provides background data but not applicable to sensitive lands model themes. Map of Gallatin County structures developed since 2003 used instead.	https://gallatincomt.virtualtownhall.net/geographic-information-systems/pages/data-download
Recent Aerial Imagery (If available)	N/A	Aerial imagery of the study area	Provides background data but not applicable to sensitive lands model themes.	Not available.
City of Bozeman Annexations	City of Bozeman	Annexations for Bozeman, Montana	Provides background data but not applicable to sensitive lands model themes.	Received through email correspondence with Gallatin County
Planning Projects	City of Bozeman	Planning projects within Bozeman, Montana.	Provides background data but not applicable to sensitive lands model themes.	Received through email correspondence with the City of Bozeman

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Descriptions of Data Sources Considered but Excluded from the Model Analysis

Layer	Source	Definition	Reason for Exclusion	Link
Wilderness & Wild and Scenic Rivers Study Area	U.S. Forest Service	Study areas designated as either wilderness or wild and scenic rivers.	Not in Study Area.	https://data.fs.usda.gov/geodata/other_fs/wilderness/stateMap.php?stateID=MT
Rock Outcrops	Multi-Resolution Land Characteristics (MRLC) Consortium	Presence of rock outcrops (determined via USGS land cover raster data)	Not applicable to sensitive lands model themes.	https://www.mrlc.gov/data?f%5B0%5D=year%3A2019
Land Cover	Multi-Resolution Land Characteristics (MRLC) Consortium	Data indicating vegetative communities, water, wetlands, impermeable surfaces, agriculture, and other land types.	Other more specific sources used for vegetation, water, wetlands, etc.	https://www.mrlc.gov/data?f%5B0%5D=year%3A2019
NEPA Files Database	U.S. Environmental Protection Agency	Database containing NEPA compliance data (Categorical Exclusions, Environmental Assessments, Findings of No Significant Impacts)	Not spatial data.	https://cdxapps.epa.gov/cdx-enepa-II/public/action/nepa/search
Farms Under Threat 2040	American Farmland Trust	Spatial mapping analyses of agricultural land conversion	Not an authoritative data source	https://csp-fut.appspot.com/
Surficial Geologic Layer (Modern Floodplains)	Montana Bureau of Mines and Geology	There are west and east Gallatin valley maps at a 1:50,000 scale. The Quaternary alluvium landforms are the youngest landforms and are formed by modern fluvial process and represent modern floodplains. Older floodplains are mapped as terraces.	Floodplain is included in the models through a different authoritative source.	http://www.mbmg.mtech.edu/Information/StoryMaps/GeologicMaps.asp
National Land Cover Database	U.S. Geological Survey	30 Meter Resolution Product	Other more specific sources used for vegetation, water, wetlands, etc.	https://www.usgs.gov/node/279743
Neighborhood at Risk Tool	Headwaters Economic	Looks at demographic data and climate risk data.	Does not cover entire Study Area.	https://nar.headwaterseconomics.org/3000008950/explore/map
Ebird	The Cornell Lab of Ornithology	A crowd sourced dataset for bird observations which may have limitations	Crowd sourced data is not reliable enough for inclusion in the model without intensive quality assurance.	https://ebird.org/home
Collard Wildlife Data	Montana Fish, Wildlife, and Parks	Big game locations are tracked via radio collars to help estimate population and wildlife corridors	This data is only available to FWP biologists and could be used as a way to check the work but is too sensitive to be provided to the public.	Not available.
Beaver Restoration Assessment Tool (BRAT)	Utah State University	BRAT is planning tool intended to help researchers, restoration practitioners and resource managers assess the potential for beaver as a stream conservation and restoration agent over large regions and watersheds.	Not applicable at this scale.	https://brat.riverscapes.net/
Montana Impaired Waters 2020	Montana Department of Environmental Quality	Impaired waterways and hotspots for high nitrogen and phosphorus layers.	Montana Impaired Waters only covers a selection of waterways in the study area, which raised concern of giving covered waterways a higher sensitive priority rating while others deserve a similar rating but are excluded because of lack of coverage.	https://discover-mtdeq.hub.arcgis.com/maps/montana-impaired-waters-2020/about
Resilient and Connected Landscapes	The Nature Conservatory	Models resilience, permeability, and diversity to develop a connected network of sites that both represents the full suite of geophysical settings and has the connections necessary to support the continued rearrangement of species in response to change.	Too large scale	https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/resilience/Pages/Downloads.aspx
Montana Climate Assessment	MSU/State of Montana	Includes data on Water Quality, Air Quality, Remediation, Energy, Mining, Waste management, and Permitting data	Not applicable at this scale.	https://discover-mtdeq.hub.arcgis.com/#BrowseLayers

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Descriptions of Data Sources Considered but Excluded from the Model Analysis

Layer	Source	Definition	Reason for Exclusion	Link
NRCS Montana Snow Survey Program	NRCS	Provides mountain snowpack and precipitation data via manual snowpack measurements (Snow Courses) and the SNOwpack TELemetry (SNOTEL) network to forecast snowmelt-driven runoff during spring and summer.	Spatial data for snow retention areas seems limited.	nrcs.usda.gov/wps/portal/wcc/home/quicklinks/states/montana/
Night Sky Finder	Night Sky Finder	Data indicated levels of light pollution globally.	Scale is too large to be appropriate.	https://darksitefinder.com/maps/world.html#10/45.7445/-111.0814
Big game priority habitat	Montana Fish, Wildlife, and Parks	Montana FWP has identified four priority areas for big-game winter range and migration corridors.	No identified areas in the Study Area.	https://gis-mtfwp.hub.arcgis.com/datasets/5d707d39e3114cdc9b5d2202fc9fc13f_0/explore?location=45.376200%2C-111.301131%2C9.34
Impaired Waters	Montana Department of Environmental Quality	A layer indicating waterways that have been designated as impaired. Attributes identify what they are impaired for.	Incomplete evaluation within the dataset. Review of the DEQ web application presents additional data. Coverage is somewhat limited in the Study Area – only when monitored/evaluated. Majority of the streams in the area have not been assessed.	https://discover-mtdeq.hub.arcgis.com/maps/montana-impaired-waters-2020/about
Cropscape	U.S. Department of Agriculture	A raster, geo-referenced, crop-specific land cover map for the continental United States.	Other authoritative source used instead.	https://data.nal.usda.gov/dataset/cropscape-cropland-data-layer
Wildland Urban Interface	U.S. Forest Service, Gallatin County	Maps the transitional zone between the built and natural environment.	Data not accessible.	https://www.readygallatin.com/wp-content/uploads/2019/06/Gallatin-County-WUI_with-labels.pdf; https://www.nicepng.com/ourpic/u2q8y3a9q8a9q8t4_gallatin-county-wildland-urban-interface-map/; https://dnrc.mt.gov/_docs/forestry/cwpp/Gallatin_8x11.pdf
Randomized Shortest Paths for Grizzly Bear Dispersal	U.S. Geological Survey (2017)	Randomized shortest path raster estimating potential dispersal paths for male-mediated gene flow for one of two populations of grizzly bears, the the Greater Yellowstone Ecosystem (GYE) and North Continental Divide Ecosystem (NCDE) populations. Raster cell size for this input is 300 x 300 meters.	More recent data became available in 2023 for grizzly bear movement pathways and this layer was replaced in the connectivity model.	https://www.sciencebase.gov/catalog/item/59149ee6e4b0e541a03e9a58
Protected Areas Database	U.S. Geological Survey (2022)	Unifies regions of wildlife corridors, watersheds, and trail systems and are already protected to varying degrees.	All areas in this database are already covered by the conservation easements and managed areas layers. The small polygons that are not covered by these two layers represent a conservation easement and is likely less accurate than the conservation easement data provided by Gallatin County and the Montana State Library.	https://www.usgs.gov/programs/gap-analysis-project/science/pad-us-data-overview
Elk, mountain goat, mule deer, moose, pronghorn antelope, white-tail deer distributions in Montana	Montana Fish, Wildlife, and Parks Department	General (and winter when available) distribution of elk, mountain goat, mule deer, pronghorn antelope, and white-tailed deer. Distribution is not mapped in National Parks and Indian Reservations. Large game represent important species in Gallatin Valley. These species may also correlate with other important species.	Very large scale datasets that are not frequently updated.	Elk: https://arcg.is/0bufmr Mountain goat: https://arcg.is/0Tjujq Mule deer: https://arcg.is/1bG5Du0 Moose: https://arcg.is/SyGXy Pronghorn antelope: https://arcg.is/1Cyi95 White-tail deer: https://arcg.is/L1fPr0

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Descriptions of Model Inputs and Processing

The table below summarizes details for model inputs and spatial layers included on Plan maps. Links to the original source and data download are also included when possible.

Descriptions of Model Inputs and Processing

	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
Wildlife & Biodiversity	These lands contain important wildlife habitat and plant communities that contribute to an intact and diverse Greater Yellowstone ecosystem. Wildlife relies on the Gallatin Valley for food, reproduction, and critical winter range. All plants and wildlife, and especially keystone species require healthy and cohesive habitats.								
	Predicted Bird Biodiversity	Raster	Montana Natural Heritage Program	2022	Locations of low to high bird biodiversity (more biodiversity the more sensitive the land as a critical ecosystem). Inputs to this biodiversity model raster were normalized to a 90 x 90 meter grid, which is the finest scale that this data can be considered for. **Weighting inside dataset:** Data type for this layer is continuous, so scoring categories split the data into a top, middle, and bottom third of data values.	Optimal suitability: 75 - 100% of value (3) Moderate suitability: 25 - 75% of value (2) Low Suitability: 0 - 25% of value (1)	1. Extracts layer areas only within the study area. 2. Assigns a score from 1 (lowest) to 3 (highest) to each attribute as described in the attribute selection column. 3. Converts layer from raster to polygon. 4. Renames the attribute field with rankings from GRIDCODE to descriptive scoring field name.	Habitat Suitability for Biodiversity task on map viewer web application. Individual Species Predicted Habitat Suitability Models at https://mtnhp.org/models/	Gallatin, Madison, and Broadwater Counties
	Predicted Reptile Biodiversity	Raster	Montana Natural Heritage Program	2022	Locations of low to high reptile biodiversity (more biodiversity the more sensitive the land as a critical ecosystem). Inputs to this biodiversity model raster were normalized to a 90 x 90 meter grid, which is the finest scale that this data can be considered for. **Weighting inside dataset:** Data type for this layer is continuous, so scoring categories split the data into a top, middle, and bottom third of data values.	Optimal suitability: 75 - 100% of value (3) Moderate suitability: 25 - 75% of value (2) Low Suitability: 0 - 25% of value (1)	1. Extracts layer areas only within the study area. 2. Assigns a score from 1 (lowest) to 3 (highest) to each attribute as described in the attribute selection column. 3. Converts layer from raster to polygon. 4. Renames the attribute field with rankings from GRIDCODE to descriptive scoring field name.	Habitat Suitability for Biodiversity task on map viewer web application. Individual Species Predicted Habitat Suitability Models at https://mtnhp.org/models/	Gallatin, Madison, and Broadwater Counties
	Predicted Amphibian Biodiversity	Raster	Montana Natural Heritage Program	2022	Locations of low to high amphibian biodiversity (more biodiversity the more sensitive the land as a critical ecosystem). Inputs to this biodiversity model raster were normalized to a 90 x 90 meter grid, which is the finest scale that this data can be considered for. **Weighting inside dataset:** Data type for this layer is continuous, so scoring categories split the data into a top, middle, and bottom third of data values.	Optimal suitability: 75 - 100% of value (3) Moderate suitability: 25 - 75% of value (2) Low Suitability: 0 - 25% of value (1)	1. Extracts layer areas only within the study area. 2. Assigns a score from 1 (lowest) to 3 (highest) to each attribute as described in the attribute selection column. 3. Converts layer from raster to polygon. 4. Renames the attribute field with rankings from GRIDCODE to descriptive scoring field name.	Habitat Suitability for Biodiversity task on map viewer web application. Individual Species Predicted Habitat Suitability Models at https://mtnhp.org/models/	Gallatin, Madison, and Broadwater Counties

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Descriptions of Model Inputs and Processing

	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
	Predicted Biodiversity of Plant Species of Concern	Raster	Montana Natural Heritage Program	2022	Locations of low to high plant biodiversity (more biodiversity the more sensitive the land as a critical ecosystem). Inputs to this biodiversity model raster were normalized to a 90 x 90 meter grid, which is the finest scale that this data can be considered for. **Weighting inside dataset**: Data type for this layer is continuous, so scoring categories split the data into a top, middle, and bottom third of data values.	Optimal suitability: 75 - 100% of value (3) Moderate suitability: 25 - 75% of value (2) Low Suitability: 0 - 25% of value (1)	1. Extracts layer areas only within the study area. 2. Assigns a score from 1 (lowest) to 3 (highest) to each attribute as described in the attribute selection column. 3. Converts layer from raster to polygon. 4. Renames the attribute field with rankings from GRIDCODE to descriptive scoring field name.	Habitat Suitability for Biodiversity task on map viewer web application. Individual Species Predicted Habitat Suitability Models at https://mtnhp.org/models/	Gallatin, Madison, and Broadwater Counties
	Predicted Native Fish Biodiversity	Raster	Montana Natural Heritage Program	2022	Locations of low to high native fish biodiversity (more biodiversity the more sensitive the land as a critical ecosystem). Inputs to this biodiversity model raster were normalized to a 90 x 90 meter grid, which is the finest scale that this data can be considered for. **Weighting inside dataset**: Data type for this layer is continuous, so scoring categories split the data into a top, middle, and bottom third of data values.	Optimal suitability: 75 - 100% of value (3) Moderate suitability: 25 - 75% of value (2) Low Suitability: 0 - 25% of value (1)	1. Extracts layer areas only within the study area. 2. Assigns a score from 1 (lowest) to 3 (highest) to each attribute as described in the attribute selection column. 3. Converts layer from raster to polygon. 4. Renames the attribute field with rankings from GRIDCODE to descriptive scoring field name.	Habitat Suitability for Biodiversity task on map viewer web application. Individual Species Predicted Habitat Suitability Models at https://mtnhp.org/models/	Gallatin, Madison, and Broadwater Counties
	Predicted Mammal Biodiversity	Raster	Montana Natural Heritage Program	2022	Locations of low to high mammal biodiversity (more biodiversity the more sensitive the land as a critical ecosystem). Inputs to this biodiversity model raster were normalized to a 90 x 90 meter grid, which is the finest scale that this data can be considered for. **Weighting inside dataset**: Data type for this layer is continuous, so scoring categories split the data into a top, middle, and bottom third of data values.	Optimal suitability: 75 - 100% of value (3) Moderate suitability: 25 - 75% of value (2) Low Suitability: 0 - 25% of value (1)	1. Extracts layer areas only within the study area. 2. Assigns a score from 1 (lowest) to 3 (highest) to each attribute as described in the attribute selection column. 3. Converts layer from raster to polygon. 4. Renames the attribute field with rankings from GRIDCODE to descriptive scoring field name.	Habitat Suitability for Biodiversity task on map viewer web application. Individual Species Predicted Habitat Suitability Models at https://mtnhp.org/models/	Gallatin, Madison, and Broadwater Counties
	Wildlife and Biodiversity Results layer	Geodatabase feature class		2023	This layer displays the results of the wildlife and biodiversity sensitivity model, which consists of an overall sensitivity score calculated by summing all scores assigned to each input layer, where higher scores indicate areas with either a larger diversity of layers or higher individual scoring for data present in the area. **Weighting inside theme**: All wildlife and biodiversity datasets given the same relative weight. No type of wildlife is weighted for more sensitivity than the others.	N/A	1. Creates a union of all processed input layers. 2. Adds a field for overall sensitivity score. 3. Calculates the sensitivity score by adding all the scores calculated for each input layer. 4. Deletes excess fields not related to the assigned input and sensitivity scores.	https://gallatin-valley-plan-bozeman.hub.arcgis.com/	Gallatin, Madison, and Broadwater Counties

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Descriptions of Model Inputs and Processing

	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
Connectivity	These lands facilitate ecological interactions and wildlife movement to food, shelter, reproduction, clean water, and critical winter ranges. This land also provides for the emotional and physical well-being of residents, such as through scenic landscapes and recreation. Nodes are often large publicly managed lands with multiple use mandates. While data representing wildlife corridors is not publicly available at the scale needed for this analysis, this layer represents areas with more intact habitat, riparian and wetland areas, and big game winter distributions, which may indicate nodes that could benefit actual wildlife corridors if protected from degradation and connected through future protections.								
	Montana Wetland Framework	Shapefile	Montana Natural Heritage Program	2021	Wetlands are a vital ecosystem for habitat corridors and connectivity for wildlife and water quality/quantity. **Weighting inside dataset**: All wetlands weighted equally for sensitivity. **Weighting inside theme:** Wetlands and their buffers are assigned the highest scoring available because wetlands are known critical wildlife movement corridors.	Select all - buffer by 150 feet (300 foot corridor) (3)	1. Extracts layer areas only within the study area. 2. Buffers riparian areas by 150 feet on each side, creating a 300-foot corridor. 3. Adds an empty field for the wetland score. 4. Calculates a score in the wetland score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did=%7Bf57e92f5-a3fa-45b2-9de8-0ba46bbb2d46%7D	Gallatin, Madison, and Broadwater Counties
	Montana Riparian Framework	Shapefile	Montana Natural Heritage Program	2021	Riparian Areas are a vital ecosystem for habitat corridors and connectivity for wildlife and water quality/quantity. **Weighting inside dataset**: All riparian areas weighted equally for sensitivity. **Weighting inside theme:** Riparian areas and their buffers are assigned the highest scoring available because they are known critical wildlife movement corridors.	Select all - buffer by 150 feet (300 foot corridor) (3)	1. Extracts layer areas only within the study area. 2. Buffers riparian areas by 150 feet on each side, creating a 300-foot corridor. 3. Adds an empty field for the riparian score. 4. Calculates a score in the riparian score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did=%7Bf57e92f5-a3fa-45b2-9de8-0ba46bbb2d46%7D	Gallatin, Madison, and Broadwater Counties
	Conservation Easements	Shapefile	Montana State Library, Gallatin County	2023	Areas that are already protected by conservation easements so won't need a priority ranking, but could influence protection of surrounding sensitive lands. Within the connectivity model, these areas act as desirable nodes to connect. **Weighting inside dataset**: All conservation easements weighted equally for sensitivity **Weighting inside theme:** Conservation easements are given a reduced score because they represent potential nodes for wildlife movement rather than pathways.	Select all (1)	**Model Methods for conservation easements, managed areas, and dedicated parks and open space layers:** 1. Extracts each layer except the Park Maintenance layer only within the study area (3 intersections). 2. Combines conservation easement data from Gallatin County, conservation easement data from the Montana State Library, managed areas, and park maintenance layers into one layer without overlap through three unions. 3. Adds an empty field for the protected lands score. 4. Calculates a score in the protected lands score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	Montana State Library: https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={9d69b262-b766-11e2-bc7e-f23c91aec05e} Gallatin County data received through correspondence.	Gallatin, Madison, and Broadwater Counties

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	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
	Managed Areas	Shapefile	Montana State Library	2021	Contains information on special land designations that impact management decisions. Examples include Indian Reservations, National Wildlife Refuges, State Parks, and Wilderness Areas. Within the connectivity model, these areas act as desirable nodes to connect. **Weighting inside dataset**: All managed areas weighted equally for sensitivity. **Weighting inside theme:** Management areas are given a reduced score because they represent potential nodes for wildlife movement rather than pathways.	Select all (1)	Continued: **Conservation Easement Acres Indicator:** This model also calculates acreage of conservation easements by using the results of the union of the two easements layer as an input. These tools 1. Calculate acreage of all polygons. 2. Exports attribute table of input to excel. **Managed Lands Acres Indicator:** This model also calculates acreage of managed lands by using the results of the union of the managed lands and the dedicated parks and open spaces, using the same process as the conservation easements indicator calculation.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={80C2319F-17BC-4A67-B0DF-BB12B53D1D5E}	Gallatin, Madison, and Broadwater Counties
	Dedicated Parks and Open Space	Shapefile	City of Bozeman	2023	Contains polygons of dedicated park land and open space managed by the City of Bozeman. **Weighting inside dataset:** All dedicated parks and open space are weighted equally for sensitivity. **Weighting inside theme:** Dedicated parks and open space are given a reduced score because they represent potential nodes for wildlife movement rather than pathways.	Select all (1)		Received through correspondence from Gallatin County	City of Bozeman
	Predicted Directed Female Grizzly Bear Connectivity Pathways	Raster	U.S. Geological Survey	2023	Predicted female grizzly bear connectivity pathways summarized from five sets of randomized shortest path movement simulations, with lower values corresponding to lower connectivity and higher values corresponding to higher connectivity. Female grizzly bear pathways were selected according to Working Group guidance because they are more indicative of populations setting up home ranges. **Weighting inside of this dataset:** Data type for this layer is continuous, so scoring categories split the data into a fourths of data values for scores 0 - 3. **Weighting inside of this theme:** High density grizzly dispersal data was given the highest available scoring as the only species corridor data present in this theme.	No paths: 0 - 4 (0) Low Density: 4 - 6 (1) Moderate Density: 6 - 8 (2) High Density: 8 - 10 (3)	1. Extracts layer areas only within the study area. 2. Assigns a score from 0 (lowest) to 3 (highest) to each attribute as described in the attribute selection column. 4. Converts layer from raster to polygon. 5. Renames the attribute field with rankings from GRIDCODE to descriptive scoring field name.	https://www.sciencebase.gov/catalog/item/6491b06bd34ef77fcb004422	Gallatin, Madison, and Broadwater Counties

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	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
	Predicted Undirected Female Grizzly Bear Connectivity Pathways	Raster	U.S. Geological Survey	2023	Predicted female grizzly bear connectivity pathways summarized from undirected movement simulations, with lower values corresponding to lower connectivity and higher values corresponding to higher connectivity. Female grizzly bear pathways were selected according to Working Group guidance because they are more indicative of populations setting up home ranges. **Weighting inside dataset:** Data type for this layer is continuous, so scoring categories split the data into a fourths of data values for scores 0 - 3. **Weighting inside theme:** High density grizzly dispersal data was given the highest available scoring as the only species corridor data present in this theme.	No paths: 0 - 5 (0) Low Density: 5 - 7 (1) Moderate Density: 7 - 9 (2) High Density: 9 - 10 (3))	1. Extracts layer areas only within the study area. 2. Assigns a score from 0 (lowest) to 3 (highest) to each attribute as described in the attribute selection column. 4. Converts layer from raster to polygon. 5. Renames the attribute field with rankings from GRIDCODE to descriptive scoring field name.	https://www.sciencebase.gov/catalog/item/6491b06bd34ef77fcb004422	Gallatin, Madison, and Broadwater Counties
	Wildlife Resource Value on Private Lands	Shapefile	Montana Fish, Wildlife, and Parks Department	2021	This layer ranks wildlife habitat based on importance to wildlife. Core habitat include surface water features and other important areas (note that the report identifies raptor nests as important but these are not mapped). Higher value land includes areas with some native habitat and areas with higher wildlife areas, while lower value includes agricultural land, subdivisions, and areas with lower wildlife use. **Weighting inside of this dataset:** Areas designated as core wildlife habitat (included channel migration corridors) were given the highest available score, with scoring decreasing in value for higher value areas and again for lower value areas. Urban and urbanizing areas were not allocated with any points since this areas have the lowest value for wildlife and are highly impacted by human use. **Weighting inside of this theme:** Scoring for this layer starts with the highest available score since it acts as an indicator for wildlife nodes within movement corridors.	Core Wildlife Habitat (3) Channel Migration Zone (3) Higher Value For Wildlife (2) Lower Value For Wildlife (1) Urban/Urbanizing Area (0)	1. Extracts layer areas only within the study area. 2. Adds an empty field for the wildlife score. 3. Calculates a score in the wildlife score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://gallatincomt.virtualtownhall.net/sites/g/files/vyhlif606/f/pages/growth_policy_-_final_full_document_9.1.21.pdf	Gallatin County on Private Lands

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	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
	Connectivity Results layer	Geodatabase feature class		2023	This layer displays the results of the connectivity sensitivity model, which consists of an overall sensitivity score calculated by summing all scores assigned to each input layer, where higher scores indicate areas with either a larger diversity of layers or higher individual scoring for data present in the area..	N/A	1. Creates a union of all processed input layers. 2. Adds a field for overall sensitivity score. 3. Calculates the sensitivity score by adding all the scores calculated for each input layer. 4. Deletes excess fields not related to the assigned input and sensitivity scores.	https://gallatin-valley-plan-bozeman.hub.arcgis.com/	Gallatin, Madison, and Broadwater Counties
	Generalized Connectivity Pathways	Geodatabase feature class	Consultation with Montana Fish, Wildlife, and Parks Department	2023	This layer displays generalized pathways that could provide connections between potential wildlife hotspots. They do not represent actual corridors since telemetry and GPS tracking is confidential and not available for this study from Montana Fish, Wildlife, and Parks (FWP). **This layer has no weighting.**	N/A	Generalized pathways were identified by highlighting potential pathways between biodiversity hotspots from the Wildlife and Biodiversity Results layer and through email correspondence and discussions with FWP.	https://gallatin-valley-plan-bozeman.hub.arcgis.com/	Gallatin, Madison, and Broadwater Counties
Agricultural Heritage	These working lands provide food and livestock production to maintain the community's historic economic base. Working farmlands also provide scenic views, community separation, and openness that help maintain the unique sense of place. Agriculture secondarily provides wildlife habitat and movement, especially to wintering big game. This land is typically privately owned and public access is limited.								
	Prime Soils/AG Lands	Shapefile	U.S. Geological Survey	2022	This layer identifies soils that are important for farmland productivity. **Weighting inside dataset**: Farmland with higher quality ratings are given higher scores, with lands that are not prime farmland excluded with a score of 0. **Weighting inside theme**: Areas with all prime farmland provide high quality soil conditions for farming and if developed would lose these conditions.	Select by FRMLNDCL: All areas are prime farmland (3) Farmland of local importance (2) Farmland of statewide importance (2) Prime farmland if irrigated (1) Not prime farmland (0)	1. For each county, extracts layer areas only within the study area. 2. Adds an empty field for the prime soils score. 3. Calculates a score in the prime soils score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column. 4. Creates a union of the prime soils layers for Gallatin, Madison, and Broadwater Counties into one layer.	https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx	Gallatin, Madison, and Broadwater Counties

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	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
	Non-Irrigated and Irrigated Acres (Revenue Final Land Unit (FLU) Classification)	File Geodatabase Feature Class	Work	2022	The Department of Revenue Final Land Unit Classification (FLU) is a classification of private agricultural land into one of six uses, fallow, hay, grazing, irrigated, and commercial and non-commercial forest. This layer contains forested land and agricultural land that was not classified as grazing. For the purposes of agriculture assessment, unclassified lands are considered grazing. In the sensitive lands model, this layer indicates lands that are important to agriculture, excluding grazing. **Weighting inside dataset**: Land that is already equipped with irrigation is more sensitive to developmental impacts than non-irrigated farmland. **Weighting inside theme**: This layer represents lands actively in use for non-grazing agriculture, which is the most direct estimate of agricultural lands available in the model.	Select fallow, hay, specialty crop (2) Irrigated (3)	1. Extracts layer areas only within the study area. 2. Calculates acres for each polygon. 3. Selects polygons classed as fallow, hay, specialty crop, or continuously cropped. 3. Adds an empty field for the agriculture lands score. 4. Calculates a score in the agriculture lands field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={3f9bb571-c148-4891-b929-c70b6b1a2fd5}	Gallatin, Madison, and Broadwater Counties
	Waterways (Ditches)	Shapefile	Gallatin County for Gallatin County; NHD for remaining study area	2022	Gallatin County data indicating the location of ditches, which are important connectors for farmland water. **Weighting inside dataset**: All ditches are weighted equally for sensitivity. **Weighting inside theme**: Ditches are essential for supplying water to irrigated farmland and if disrupted would also disrupt farming activities dependent on this water source.	Select by Type: Ditch or Piped Ditch (3) Buffered 100 feet on each side, creating a 200-foot corridor	1. Selects ditches and piped ditches. 2. Extracts layer areas only within the study area. 3. Buffers ditches by 100 feet on each side, creating a 200-foot corridor. 3. Adds an empty field for the waterways ditches score. 4. Calculates a score in the waterways ditches field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://gallatincomt.virtualtownhall.net/geographic-information-systems/pages/data-download	Gallatin County
	National Hydrography Dataset (NHD) (Ditches)	File Geodatabase Feature Class	U.S. Geological Survey	2019	NHD data indicating the location of ditches and piped ditches, which are important connectors for farmland water. **Weighting inside dataset**: All ditches are weighted equally for sensitivity. **Weighting inside theme**: Ditches are essential for supplying water to irrigated farmland and if disrupted would also disrupt farming activities dependent on this water source.	Select by FCODE: 33600 - Canal/Ditch (3) and 33601 - Canal/Ditch: Aquifer (3)	1. Selects canals/ditches (FCodes 33600 and 33601). 2. Extracts layer areas only within the study area. 3. Buffers ditches by 100 feet on each side, creating a 200-foot corridor. 3. Adds an empty field for the NHD ditches score. 4. Calculates a score in the NHD ditches score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://apps.nationalmap.gov/downloader/#/	Madison and Broadwater Counties

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	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
	Visual Analysis of Rural Landscape	Raster	Created from 10 meter digital elevation model (DEM) from the U.S. Department of Agriculture Natural Resources Conservation Services	Accessed March, 2023	Input prioritizing the visual identity of the rural community as analysis from major roadways. **Weighting inside dataset**: All visible areas weighted equally for sensitivity. **Weighting inside theme**: While the visibility of agricultural land from major roads is important to retaining the Gallatin Valley's unique sense of place, maintaining agricultural lands and their farm-able conditions are more critical and sensitive to development.	Visible areas (1) Non-visible areas (0)	Prior to running the model, the geodesic viewshed tool was run using as inputs 1) a mosaic of 10 meter DEMs and 2) viewpoints generated every 0.24 miles along the interstate, Norris Road, and Springhill Road, South 19th Avenue, and U.S. 191 (labeled in the data as Gallatin Road, Huffine Lane, and West and East Main Street). The analysis was run with a 6ft observer elevation for a bare earth, 2-mile viewshed. The output raster of this process was then used as an input to the model. 1. Extracts layer areas only within the study area. 2. Converts each cell value of a raster to an integer, which is necessary for the raster to be compatible with the raster to polygon tool. 3. Converts the raster to a polygon. 4. Adds an empty field for the viewshed score. 5. Calculates a score in the viewshed score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	DEM source: https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={CCC91687-A133-4270-A89F-CDCC9A091260}	Gallatin, Madison, and Broadwater Counties
	Agricultural Heritage Results layer	Geodatabase feature class		2023	This layer displays the results of the agricultural heritage sensitivity model, which consists of an overall sensitivity score calculated by summing all scores assigned to each input layer, where higher scores indicate areas with either a larger diversity of layers or higher individual scoring for data present in the area.	N/A	1. Creates a union of all processed input layers. 2. Adds a field for overall sensitivity score. 3. Calculates the sensitivity score by adding all the scores calculated for each input layer. 4. Deletes excess fields not related to the assigned input and sensitivity scores.	https://gallatin-valley-plan-bozeman.hub.arcgis.com/	Gallatin, Madison, and Broadwater Counties

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	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
Water Quality	Water systems underlies all other themes because natural water features (wetlands, riparian areas, lakes, streams, and rivers) provide critical habitat and connectivity for aquatic species and wildlife populations, clean drinking water, and resiliency to natural disasters and climate change. Human made irrigation infrastructure also provides value to the land in the form of water delivery for working farms and ranches, and groundwater recharge that supports the health of the entire ecosystem.								
	National Flood Hazard Layer	Shapefile	Federal Emergency Management Agency	2023	Floodplains act as key wildlife corridors and as crucial ecosystems that buffer/protect waterways. **Weighting inside dataset**: A and AE in the FLD_ZONE field are within the base floodplain while the other designations are either undefined or outside of the base flood zone. **Weighting inside theme**: Floodplains are given the highest available score because development within the floodplain can degrade its natural functions and destroy critical habitat movement corridors.	A, AE - high risk (3) D - undefined (0) X - moderate to low risk (0) Select A and AE	1. Selects flood zones A and AE. 2. Extracts layer areas only within the study area. 3. Adds an empty field for the floodplain score. 4. Calculates a score in the floodplain score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://www.fema.gov/flood-maps/national-flood-hazard-layer	Gallatin, Madison, and Broadwater Counties
	Waterways (Streams and Rivers)	Shapefile	Gallatin County	2022	Waterways act as key wildlife corridors, biodiversity hotspots, and are essential for biological system function. The Gallatin County waterways data is the most accurate surface water dataset available for the county and is updated annually. **Weighting inside dataset**: In Gallatin Valley, different development buffers and setbacks are applied to waterways depending on the width of the waterway. This layer includes three different distances for buffers to account for this variation, with areas closer to the waterway having higher scores to areas farther away. **Weighting inside theme**: Waterways provide critical habitat, resources, and movement corridors for wildlife, so land with waterways and closest to the waterways are given the highest score available.	Select by stream, excluding ditches. (3) Buffer of Waterways layer: 150 feet total (3) 300 feet total (2) 500 feet total (1)	1. Selects streams. 2. Extracts layer areas only within the study area. 3. Buffers waterways by three distances: 1) 75 feet on each side, creating a 150-foot corridor, 2). 150 feet on each side, creating a 300-foot corridor, and 3) 250 feet on each side, creating a 500-foot corridor. 3. Adds an empty field for the waterways stream score. 4. Calculates a score in the waterways stream score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://gallatincomt.virtualtownhall.net/geographic-information-systems/pages/data-download	Gallatin County

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	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
	National Hydrography Dataset (NHD) (Streams and Rivers)	File Geodatabase Feature Class	U.S. Geological Survey	2019	Waterways act as key wildlife corridors, biodiversity hotspots, and are essential for biological system function. **Weighting inside dataset**: In Gallatin Valley, different development buffers and setbacks are applied to waterways depending on the width of the waterway. This layer includes three different distances for buffers to account for this variation, with areas closer to the waterway having higher scores to areas farther away. **Weighting inside theme**: Waterways provide critical habitat, resources, and movement corridors for wildlife, so land with waterways and closest to the waterways are given the highest score available.	Select by stream, excluding ditches. (3) Buffer of Waterways layer: 150 feet total (3) 300 feet total (2) 500 feet total (1)	1. Selects streams and rivers (FCodes 46000, 46003, 46006, and 46007). 2. Extracts layer areas only within the study area. 3. Buffers waterways by three distances: 1) 75 feet on each side, creating a 150-foot corridor, 2). 150 feet on each side, creating a 300-foot corridor, and 3) 250 feet on each side, creating a 500-foot corridor. 3. Adds an empty field for the NHD stream score. 4. Calculates a score in the NHD stream score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://apps.nationalmap.gov/downloader/#/	Madison and Broadwater Counties
	Montana Riparian Framework	Shapefile	Montana Natural Heritage Program	2021	Riparian Areas are a vital ecosystem for habitat corridors and connectivity for wildlife and water quality/quantity. **Weighting inside dataset**: All riparian areas weighted equally for sensitivity. **Weighting inside theme**: Riparian areas and their buffers are assigned the highest scoring available because they provide critical habitat, resources, and movement corridors for wildlife.	Select all (3)	1. Extracts layer areas only within the study area. 2. Adds an empty field for the riparian score. 3. Calculates a score in the riparian score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did=%7Bf57e92f5-a3fa-45b2-9de8-0ba46bbb2d46%7D	Gallatin, Madison, and Broadwater Counties
	Montana Wetland Framework	Shapefile	Montana Natural Heritage Program	2021	Wetlands are a vital ecosystem for habitat corridors and connectivity for wildlife and water quality/quantity. **Weighting inside dataset**: All wetlands are weighted equally for sensitivity. **Weighting inside of theme**: Wetlands and their buffers are assigned the highest scoring available because they provide critical habitat, resources, and movement corridors for wildlife.	Select all (3)	1. Extracts layer areas only within the study area. 2. Adds an empty field for the wetland score. 3. Calculates a score in the wetland score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did=%7Bf57e92f5-a3fa-45b2-9de8-0ba46bbb2d46%7D	Gallatin, Madison, and Broadwater Counties

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	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
	Channel Migration Zones (CMZ)	Shapefile	Montana State Library	2017	Interference with natural channel migration processes can result in rapid erosion and adverse impacts to aquatic and riparian biological systems. **Weighting inside dataset**: Erosion hazards zones (EHZs) are areas that channels may occupy over the period of the channel migration zone. Avulsion hazard zones (AHZs) are zones not captured by EHZs but may also be occupied by the river. Other areas in the dataset include the channel itself and historic migration zones and are not included for scoring. **Weighting inside theme**: Channel migration zones are given the highest available score because development within channel migration zones can degrade the water system's natural functions and destroy critical habitat movement corridors.	Select by avulsion hazard zone (AHZ) and erosion hazard area (EHA) (3)	1. Selects CMZ by AHZ and EHA. 2. Extracts layer areas only within the study area. 3. Adds an empty field for the CMZ score. 4. Calculates a score in the CMZ score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://msl.mt.gov/geoinfo/data/montana_channel_migration_zones/data_maps_and_reports	Gallatin, Madison, and Broadwater Counties
	Recommended areas for water recharge suitability investigation	File Geodatabase Feature Class	Bren School of Environmental Science & Management at the University of California, Santa Barbara.	2016	Shows areas that satisfy the recharge criterion of: surficial geology, slope, soil type, land use, land ownership, depth of the groundwater. This recharge suitability analysis is intended to guide the Water Exchange's initial selection of land parcels. However, further on-site hydrogeological investigation will be required to confirm that the hydrogeological conditions will allow sufficient volumes of water to be infiltrated into the aquifer. **Weighting inside dataset**: All recommended areas are weighted equally for sensitivity. **Weighting inside theme**: Groundwater recharge is critical for managing groundwater supply and pollutant removal for the ecosystems and human use. Development often includes significant increases in impermeable surfaces, preventing groundwater recharge from occurring, increasing the importance of protecting areas with the proper conditions for recharge.	Select all (3)	1. Adds an empty field for the recharge score. 2. Calculates a score in the recharge score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://montanagroundwater.weebly.com/uploads/5/2/1/6/52163899/gvwe_management_plan.pdf https://montanagroundwater.weebly.com/final-report.html	Gallatin County

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	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
	Climate Resilient Watersheds		The Nature Conservancy/ DTM Consulting	2015	As climate change progresses, the watersheds that provide the Gallatin Valley with water will be increasingly critical to protect. This layer highlights which watersheds contain areas with high elevation and low insolation and are more likely to contain resilient snow pack. **Weighting inside dataset**: Scoring reflects the categories of shade categories provided by the authors in their map symbology. **Weighting inside theme**: The areas in the highest category for this dataset are given the highest score available because that are critical for ensuring future water supply for the Valley as climate change progresses.	Select all; Symbolized by LowAcres (Acres of Low Insolation) 1 - 1000 (Low Shade): 1 1000 - 3000 (Medium Shade): 2 3000 and above (High Shade): 3	1. Extracts layer areas only within the study area. 2. Creates a union between the Gallatin County stream layer and the Madison and Broadwater stream layer into one stream layer that covers the entire study area. 3. Finds the streams that intersect each watershed. 1. Adds an empty field for the watershed score. 2. Calculates a score in the watershed score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column. This score is assigned to streams based on the level of insolation of the watershed that they intersect with.	Provided by The Nature Conservancy through email correspondence https://drive.google.com/file/d/1EV0SuP83VFMAq-bBI8AFAxAjXMUCUgNP/view https://ui.adsabs.harvard.edu/abs/2018AGUFM.H31M2126L/abstract	Gallatin, Madison, and Broadwater Counties
	Buffer of Water Layers	File Geodatabase Feature Class	Intermediate Output	2023	This layer contains a three-ringed buffer around all layers in the water theme except for waterways and NHD to create the widest corridor of all water features, excluding those that are buffered individually. **Weighting inside dataset**: In Gallatin Valley, different development buffers and setbacks are applied to surface water depending on the characteristics of the surface water body. This layer includes three different distances for buffers to account for this variation, with areas closer to the water body having higher scores to areas farther away. **Weighting inside theme**: Surface water and groundwater provide critical habitat, resources, and movement corridors for ecosystems, so land with these features and closest to these features are given the highest score available.	Buffer of water layers: 150 feet total (3) 300 feet total (2) 500 feet total (1)	1. Creates a union with all input layers in this theme except for waterways and NHD into one layer. 2. Dissolves excess boundaries within unioned layer. 3. Buffers unioned layer by three distances: 1) 75 feet on each side, creating a 150-foot corridor, 2). 150 feet on each side, creating a 300-foot corridor, and 3) 250 feet on each side, creating a 500-foot corridor. 4. Adds an empty field for the buffer score. 5. Calculates a score in the buffer score field from 1 (lowest) to 3 (highest) for each attribute as described in the attribute selection column.	https://gallatin-valley-plan-bozeman.hub.arcgis.com/	Gallatin, Madison, and Broadwater Counties
	Water Results layer	Geodatabase feature class		2023	This layer displays the results of the water quality and quantity sensitivity model, which consists of an overall sensitivity score calculated by summing all scores assigned to each input layer, where higher scores indicate areas with either a larger diversity of layers or higher individual scoring for data present in the area.	N/A	1. Creates a union of all processed input layers. 2. Adds a field for overall sensitivity score. 3. Calculates the sensitivity score by adding all the scores calculated for each input layer. 4. Deletes excess fields not related to the assigned input and sensitivity scores.	https://gallatin-valley-plan-bozeman.hub.arcgis.com/	Gallatin, Madison, and Broadwater Counties

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	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
Development Constraints	Areas, regardless of sensitive land status, that are likely to be undevelopable and could de facto protected and/or are already protected from future development. An overlay layer shows where future conservation and protection efforts may be less of a priority.								
	Slope Over 25%	Shapefile	Montana Natural Heritage Program	2020	Steep slopes would present increased development challenges and are less likely to be developed so immediate actions to conserve these areas could be a lesser priority.	Select 25% slope and greater	1. Extracts layer areas only within the study area.	DEM source: https://datagateway.nrcs.usda.gov/GDGOrder.aspx	Gallatin, Madison, and Broadwater Counties
	Floodplain	Shapefile	Federal Emergency Management Agency	2023	Development is often difficult in floodplains. Floodways and 100-year floodplain are subject to floodplain regulations which do not prohibit all development but offer some ways to minimize impact.	A, AE - high risk D - undefined X - moderate to low risk Select A and AE	1. Extracts layer areas only within the study area.	https://www.fema.gov/flood-maps/national-flood-hazard-layer	Gallatin, Madison, and Broadwater Counties
	Conservation Easements	Shapefile	Montana State Library, Gallatin County	2023	These areas that are already protected by conservation easements so they won't need a priority ranking, but could influence protection of surrounding sensitive lands.	Select all	1. Extracts layer areas only within the study area.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={9d69b262-b766-11e2-bc7e-f23c91aec05e}	Gallatin, Madison, and Broadwater Counties
	Managed Areas	Shapefile	Montana State Library	2021	Contains information on special land designations that impact management decisions. Examples include Indian Reservations, National Wildlife Refuges, State Parks, and Wilderness Areas.	Select all	1. Extracts layer areas only within the study area.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={80C2319F-17BC-4A67-B0DF-BB12B53D1D5E}	Gallatin, Madison, and Broadwater Counties
	Dedicated Parks and Open Space	Shapefile	City of Bozeman	2023	Contains polygons of dedicated park land and open space managed by the City of Bozeman. On maps for this plan, dedicated parks and open space are included as managed areas.	Select all	1. Extracts layer areas only within the study area.	Received through correspondence from Gallatin County	City of Bozeman
	Development Constraints Overlay layer	Geodatabase feature class		2023	This layer displays the development constraints overlay, which consists of all development constraints layers combined into one layer without overlap.	N/A	1. Creates a union of all processed input layers. 2. Dissolves excess boundaries within unioned layer.	https://gallatin-valley-plan-bozeman.hub.arcgis.com/	Gallatin, Madison, and Broadwater Counties

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	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
Development Pressures	Areas that are most impacted by current development and likely to attract to future development. Overlay layers show where sensitive land protection priorities should be focused.								
	Minor and Major Subdivisions	Feature dataclass (polygon)	Gallatin County	2022	Considering major and minor subdivisions can help with locating where development is planned and if its occurring on or near sensitive lands including subdivisions and roads.	Select all	No processing was performed on this overlay input.	https://gallatincomt.virtualtownhall.net/geographic-information-systems/pages/data-download	Gallatin County
	Wildfire Prone Areas	Feature dataclass (polygon)	Montana Department of Natural Resources and Conservation	2020	Montana Wildlife Risk Assessment HUC 12 Watershed Summary contains data on wildfire prone areas, included in this project as an overlay to highlight sensitive lands that may be prone to wildfires.	"5 Categories; Low 0-40th Moderate 40-70th High 70-90th Very High 90-95th Extreme - >95th Water and Non-Burnable Symbolized by Total_mean_eNVC_ Percentile"	1. Extracts layer areas only within the study area. 3. Calculates acres for each polygon in the layer.	https://mwra-mtdnrc.hub.arcgis.com/datasets/MTDNRC::mwra-hydrologic-unit-code-12-digit-huc-6-watershed-summary/explore?location=46.655206%2C-109.893177%2C7.48	Gallatin, Madison, and Broadwater Counties
	Human Disturbance Index	Raster	Montana Natural Heritage Program	2016	The Montana Human Disturbance Index (HDI) represents six disturbance categories: Development, Transportation, Agriculture, Resource Extraction/Energy Development, Introduced Vegetation, and Forestry Practices	Select all	1. Extracts layer areas only within the study area. 2. Converts each cell value of a raster to an integer, which is necessary for the raster to be compatible with the raster to polygon tool. 3. Converts the raster to a polygon.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={639e7c86-8224-11e4-b116-123b93f75cba}	Gallatin, Madison, and Broadwater Counties
	Climate Resilient Watersheds	Feature dataclass (polygon)	The Nature Conservancy/ DTM Consulting	2015	As climate change progresses, the watersheds that provide the Gallatin Valley with water will be increasingly critical to protect. This layer highlights which watersheds contain areas with high elevations and low insolation and are more likely to contain resilient snow pack.	Select all; Symbolized by LowAcres (Acres of Low Insolation) 1 - 1000 (Low Shade) 1000 - 3000 (Medium Shade) 3000 and above (High Shade)	1. Extracts layer areas only within the study area.	Provided by The Nature Conservancy through email correspondence https://drive.google.com/file/d/1EV0SuP83VFMAq-bBI8AFAxAjXMUCUgNP/view https://ui.adsabs.harvard.edu/abs/2018AGUFM.H31M2126L/abstract	Gallatin, Madison, and Broadwater Counties
Base Layers	All of these layers were used in maps found in the report for this plan, except for the roads and contours layers which were used to create model inputs.								
	Municipal Boundaries	Shapefile	Gallatin County	2023	Boundaries for municipalities within Gallatin County, Montana	N/A	N/A	https://gallatincomt.virtualtownhall.net/geographic-information-systems/pages/data-download	Gallatin, Madison, and Broadwater Counties
	Watershed Boundary	Feature dataclass (polygon)	Montana State Library, City of Bozeman	2022	A complete digital hydrologic unit boundary layer of the regions (2-digit HUCs), subregions (4-digit), basins (6-digit), subbasins (8-digit), watersheds (10-digit), and subwatersheds (12-digit) for Montana.	N/A	N/A	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={0077A7D3-F6C3-4D08-9837-410E79A12FCC}	Gallatin, Madison, and Broadwater Counties

APPENDICES

Descriptions of Model Inputs and Processing

	Layer	File Type	Source	Year	Definition	Attribute Scoring	Model Methods	Source Link	Coverage
	Montana Railroads	Feature dataclass (polygon)	Montana State Library	2017	The Montana Transportation Framework includes railroads data integrated from multiple sources for a statewide dataset.	N/A	N/A	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={26E71BA8-914E-458B-B2EC-62F22AD06C30}	Gallatin, Madison, and Broadwater Counties
	Roads	Shapefile	Gallatin County	2023	Contains major and local roads within Gallatin County.	N/A	This layer was used as an input in the Agricultural Heritage model's visual analysis.	https://gallatincomt.virtualtownhall.net/geographic-information-systems/pages/data-download	Gallatin, Madison, and Broadwater Counties
	Triangle Plan Boundary	Shapefile	Gallatin County	2020	The planning area for the 2020 Triangle Community Plan created in response to increase population growth in Gallatin County.	N/A	N/A	Received through correspondence from Gallatin County	Gallatin County
	City of Bozeman Growth Boundary	Shapefile	City of Bozeman	2019	The long term expected growth area for Bozeman, Montana.	N/A	N/A	https://public-bozeman.opendata.arcgis.com/datasets/bozeman::growth-policy-proposed-boundary/about	City of Bozeman
	Planning Jurisdictions for Three Forks, Manhattan, and Belgrade	Shapefile	Gallatin County	Varied	The planning jurisdiction boundaries for Three Forks, Manhattan, and Belgrade, Montana.	N/A	N/A	Received through correspondence from Gallatin County	Cities of Three Forks, Manhattan, and Belgrade
	Contours	Shapefile	Montana State Library	2008	Contour lines tagged with their represented elevations and lines representing streams and quadrangle boundaries.	N/A	This layer was used to calculate slope layer as an input for the Development Constraints overlay.	https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={CCC91687-A133-4270-A89F-CDCC9A091260}	Gallatin, Madison, and Broadwater Counties
	Gallatin Valley Structures Mapped Since 2003	Shapefile	Gallatin County	2023	Point data for structures within Gallatin County since the passage of the County's first Growth Policy in 2003.	N/A	This layer was used to create the relative structure density heat map. Point data for structures in Gallatin Valley were input to the point density tool with a 30 square meter output cell size and a 1,000 square meter radius on a circle neighborhood.	Received through correspondence from Gallatin County	Gallatin County
	Gallatin Valley Sensitive Lands Plan Study Area	Feature dataclass (polygon)	City of Bozeman	2023	This layer denotes the study area for the Gallatin Valley Sensitive Lands Plan model. Within the models for this plan, the study area acts as the extent of all other layers for analysis and is used to clip input layers.	N/A	N/A	https://gallatin-valley-plan-bozeman.hub.arcgis.com/	Gallatin, Madison, and Broadwater Counties

Note: All data for model projected into NAD 1983 StatePlane Montana FIPS 2500 (Meters).

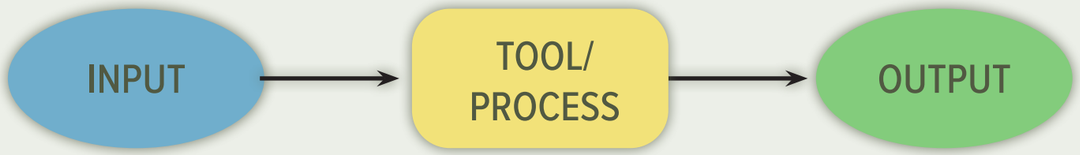
Model Design by Theme

Processing for the Four Sensitivity Themes

For each of the four themes, input layers were first limited to the Study Area and relevant attributes were selected as listed in “Descriptions of Model Inputs and Processing” of Appendix C. After additional processing as needed for individual input layers, all input polygons were combined into one results layer and their individual sensitivity scores were summed to obtain an overall sensitivity score for the theme. Additional processing included acreage calculations when needed for scoring selections, the addition of buffers, and a viewshed analysis for the Agricultural Heritage theme.

For raster data, additional processing consisted of reclassifying the values of the rasters to match the assigned sensitivity scoring levels (Appendix C), converting the raster cell values to integers if necessary, converting the rasters to polygons, and renaming the sensitivity score fields for clarity.

The following graphics provide an overview of the modeling process for each theme and overlay. Blue ovals represent inputs, green ovals are intermediate outputs and final outputs, while yellow rectangles indicate a model tool or process which applies an action to the data.



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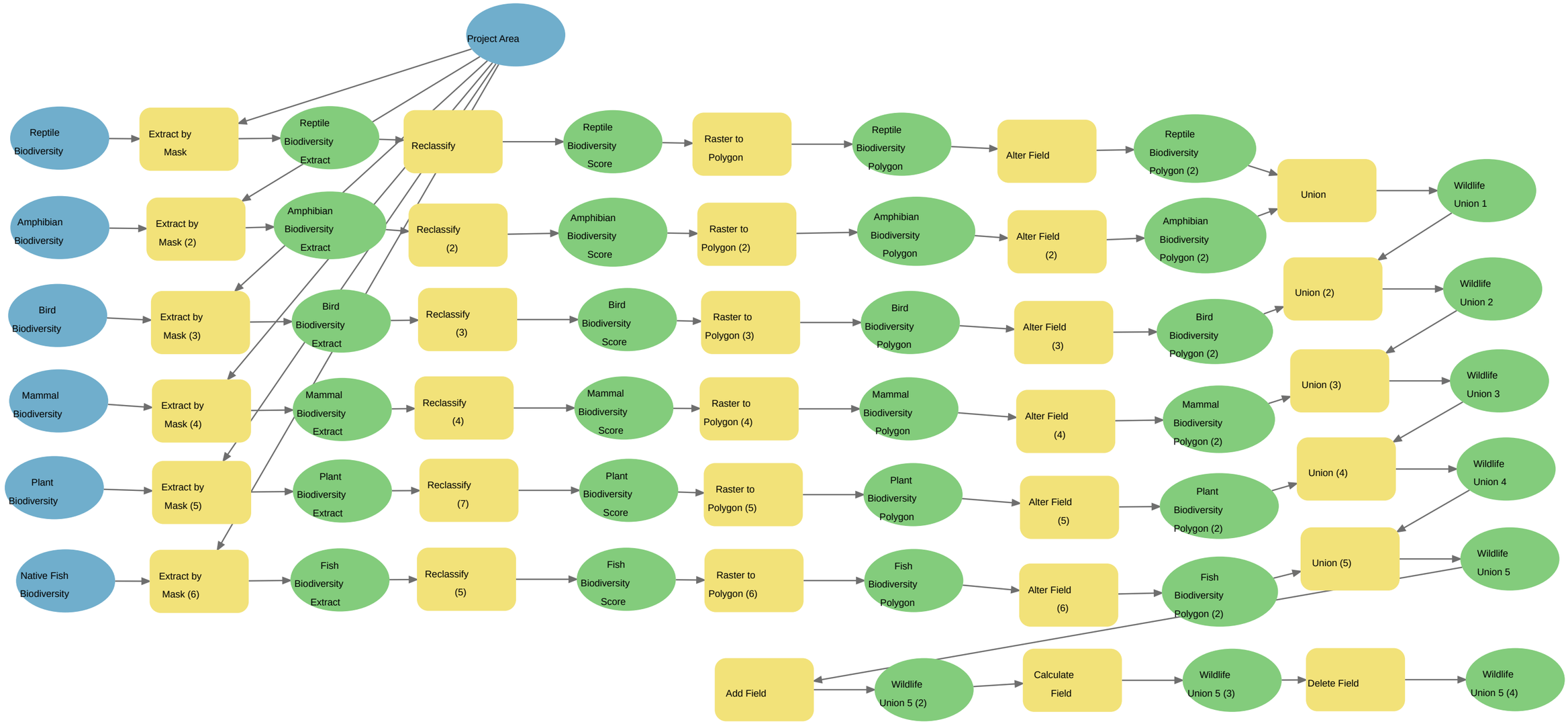
Wildlife and Biodiversity



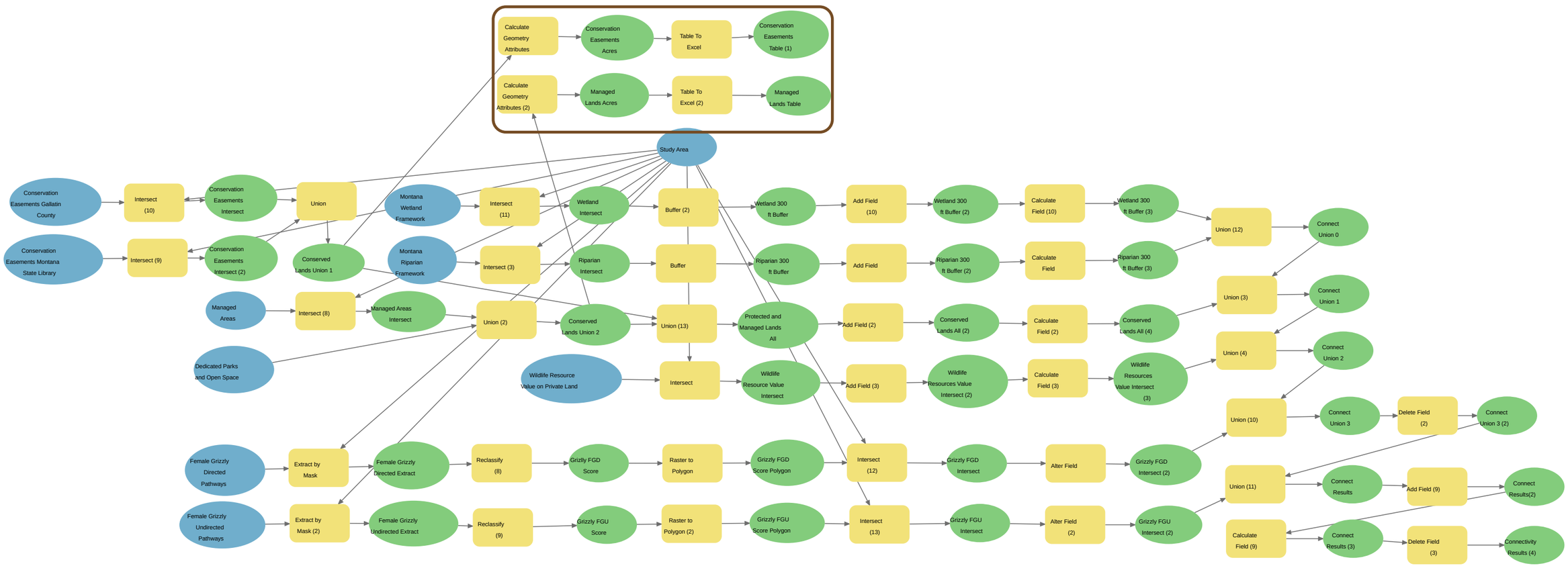
Connectivity

Generalized Connectivity Regions

Generalized regions were created to supplement the connectivity model results. Regions were selected by overlaying the Development Constraints with the Wildlife and Biodiversity model results and highlighting large biodiversity hotspots.

Regions with high biodiversity between those nodes were then highlighted as generalized connectivity regions. These regions are symbolized in the model as wide arrows with ambiguous borders to suggest regions that could be good candidates for preservation to increase connectivity between hotspot areas.

Conservation Easement and Managed Land Indicator Calculations



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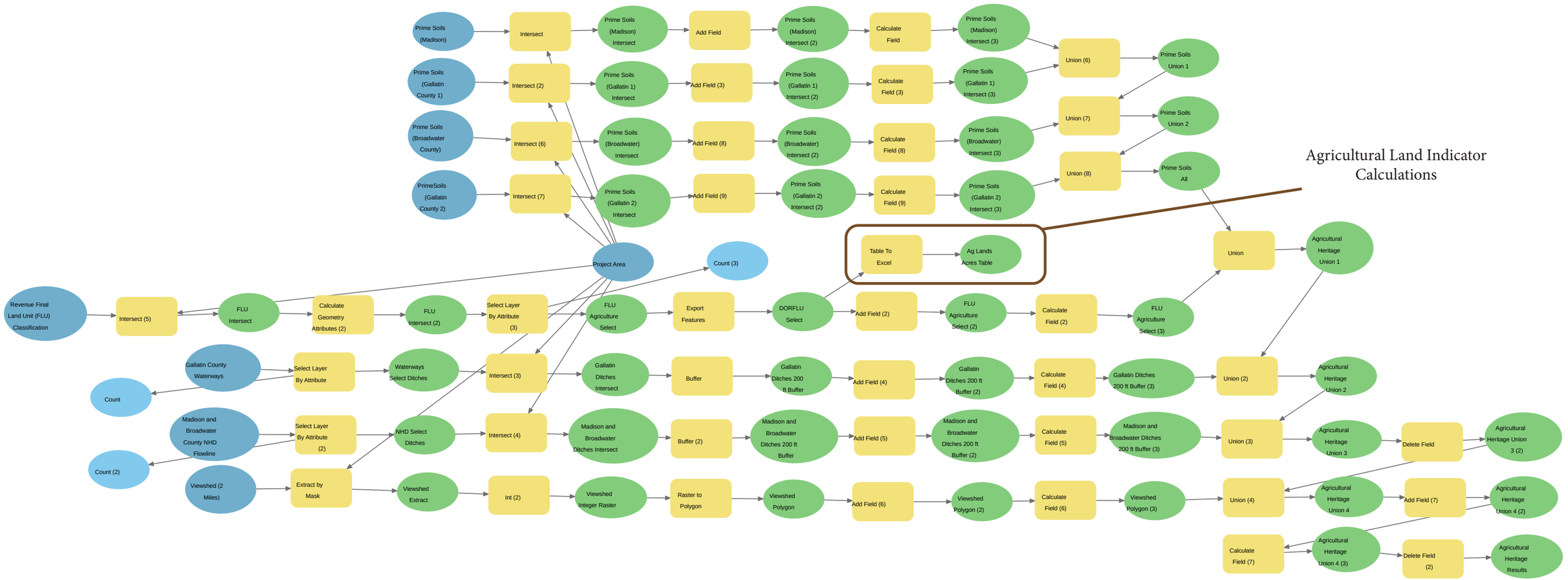
Agricultural Heritage



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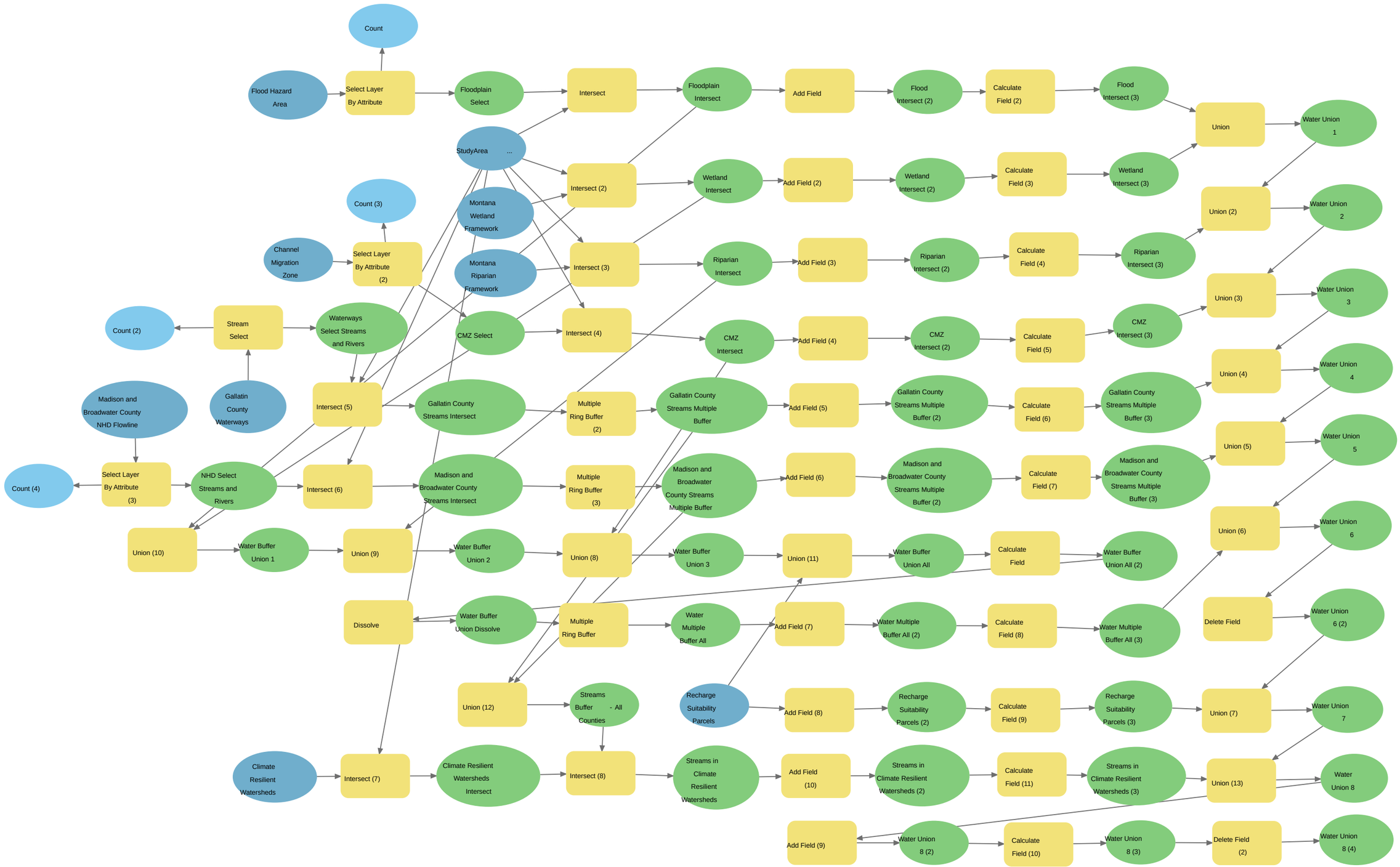
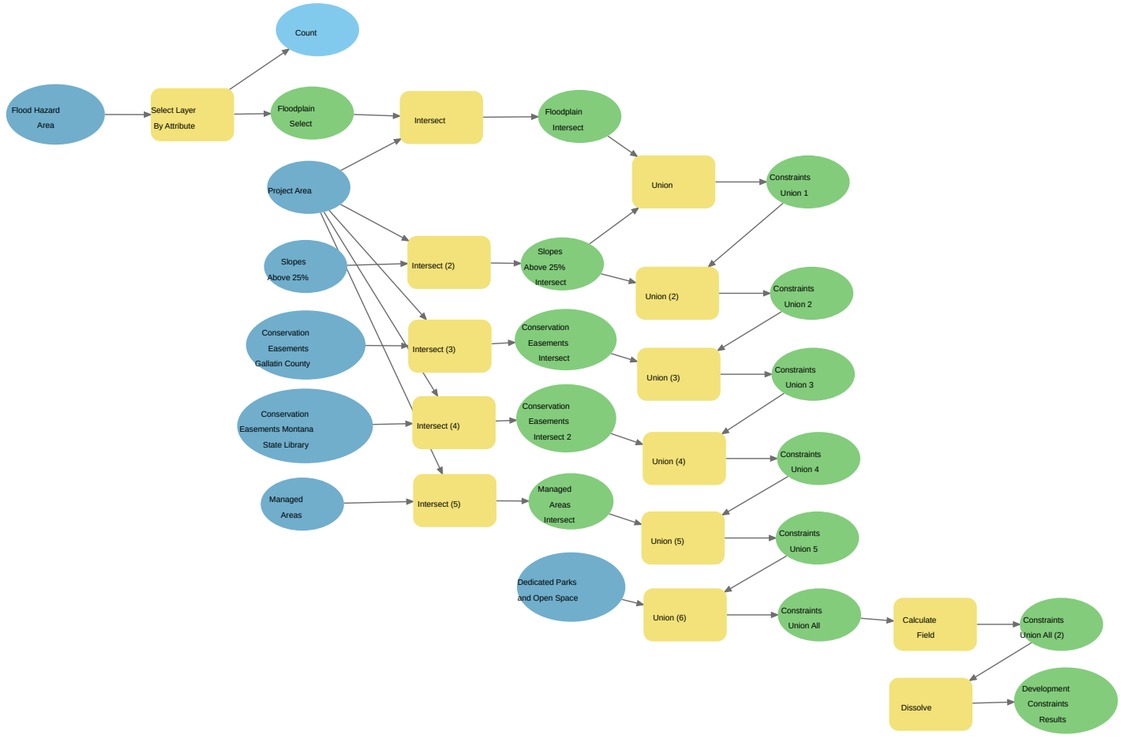
Water Quantity and Quality



Development Constraints Overlay

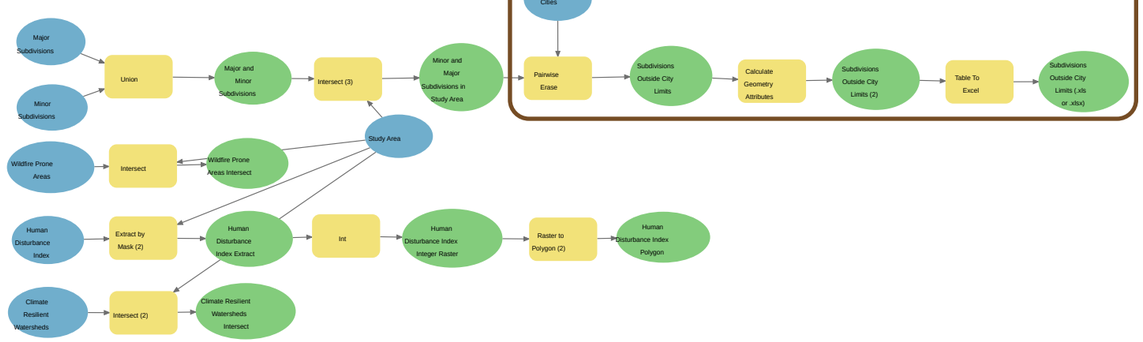
GIS results for Development Constraints were combined into one single layer and were not given sensitivity scorings. Instead, this layer acts as an overlay indicating areas that are already protected from development to some degree.



Development Pressures Data

The Development Pressures GIS exercise did not include any analysis aside from projecting data into the correct spatial reference, constraining the data to the study area, or converting raster data to a polygon when necessary.

Count of Subdivisions Outside City Limits Calculations



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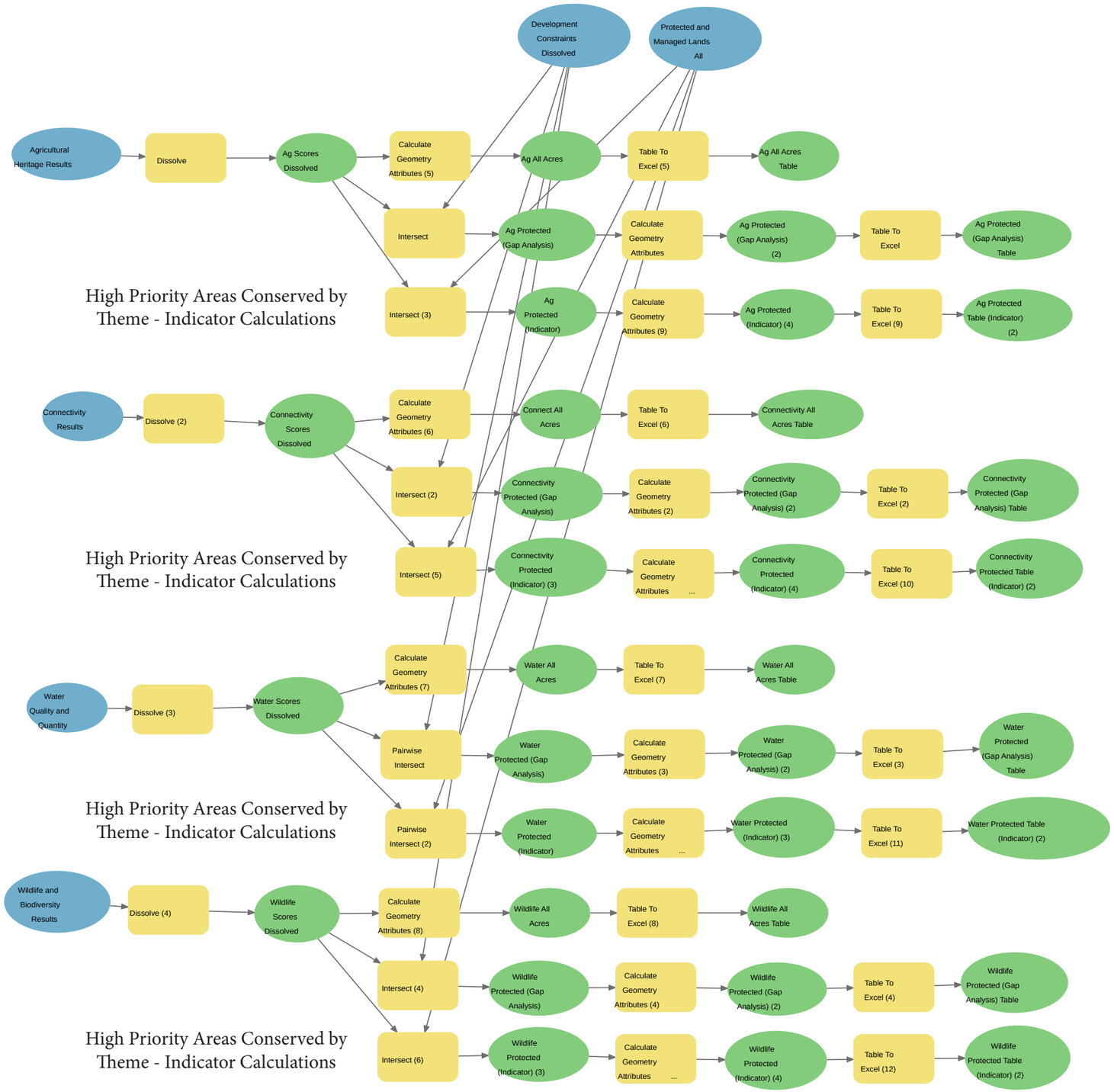
Conservation Gap Analysis

For the gap analysis, the results of each model were first dissolved along sensitivity score ratings. To calculate acreage of land with some protections under each individual theme, the results layer was then intersected with the Development Constraints overlay to represent existing protections. Then, acreage was calculated for lands with protections and for the overall acreage of each sensitivity score and a table exported to Excel.

The top third of sensitivity scores were categorized as "more sensitive" and included in the analysis. Connectivity was excluded from the analysis since the model results do not represent actual connectivity corridors and the generalized connectivity regions do not indicate specific locations.



GALLATIN VALLEY SENSITIVE LANDS PROTECTION PLAN

Connecting our Landscape, Heritage, and Future on Common Ground