

## EXECUTIVE SUMMARY

The Big Sky Sustainable Water Solutions Forum (Water Forum) is a community-based, collaborative approach building a unified vision for future Big Sky water resources management to maintain and enhance ecologically healthy river systems in the community and downstream while also identifying sustainable solutions for community water supply and wastewater treatment challenges.

The Water Forum was convened to:

- Unify efforts to address water resources for the Big Sky area and surrounding zone of influence in three co-equal water resources focus areas:
  - Ecological Health of River Systems
  - Water Supply and Availability
  - Wastewater Treatment and Reuse
- Develop recommendations for solutions and actions to address current and future water needs for both the natural and human communities
- Support community implementation of the solutions

The Big Sky Area Sustainable Watershed Stewardship Plan addresses water resources issues in the Big Sky area, which includes the West Fork Gallatin River watershed, Jack Creek watershed, and the Gallatin River mainstem and tributaries between the Corral and Karst (Highway 191 Mile Markers 42 through 55). Since the developed areas are not incorporated, the Big Sky Resort Area District boundary was established to characterize the Big Sky area for planning purposes. An associated zone of influence of the Madison and Gallatin watersheds was also identified as important since the entire area is linked through its water resources, transportation corridors, and economic base.

## WATER FORUM STAKEHOLDERS AND DECISION-MAKING PROCESS

The Water Forum is a diverse, community-based stakeholder group formed to identify and recommend priorities and actions to address water resources stewardship in the Big Sky area. The Water Forum was convened in June of 2016 following an extensive community assessment process in the spring of 2016. The Gallatin River Task Force (Task Force) hosted the Water Forum and an advisory committee guided the process. Participation as a stakeholder in the Water Forum was voluntary, and all stakeholders agreed to commit to engagement in the process and a set of ground rules. Water Forum stakeholder meetings were open to the public and members of the community participated throughout the process. Water Forum stakeholders were selected to represent community, conservation, business, agricultural, government, and agency perspectives in the Big Sky area and downstream and stakeholders have a wide variety of expertise in water resources, economic and community issues. Water Forum stakeholders and other community members worked from June 2016 to November 2017 to identify opportunities and challenges, determine desired outcomes, and develop recommendations to achieve their goals and objectives. Decisions on goals, objectives and recommended priorities and actions were made through consensus.

## CHALLENGES IN ADDRESSING WATER RESOURCES ISSUES

Water Forum stakeholders identified challenges to the effective stewardship of water resources in the Big Sky area. Some challenges, like limited water supplies, are boundaries the community must work within. Other challenges, like political, organizational, and management fragmentation, are human factors that can be managed and perhaps changed.

Within each of the three co-equal focus areas, water resources challenges include:

**The Ecological Health of the River Systems** has been impacted by changes in water quality and instream habitat. Three streams in the Big Sky area have water quality conditions that fail to meet Montana's water quality standards, including the Middle Fork West Fork Gallatin River, South Fork West Fork Gallatin River, and West Fork Gallatin River. Monitoring has been ongoing in the Gallatin and Madison watersheds in the Big Sky area, but significant questions remain about the status and trends of water quality, streamflows, riparian areas, wetlands, fisheries, and aquatic life because of gaps in the monitoring network and in community understanding. Growth, climatic variability, drought, and cumulative impacts from land use and recreation also challenge the future ability to preserve high quality river, riparian and wetland systems.

**Water Supply and Availability** are affected by increasing levels of development and predicted changes to precipitation and runoff patterns. Limited groundwater and surface water resources are not fully characterized and there are gaps in status and trends monitoring and modeling. Groundwater withdrawals from individual and community wells can have a significant impact on the availability of fresh water supplies and streamflows in the Big Sky area and downstream. Projections for water supply needs suggest that current capacity to meet community needs will be met by 2025 in some areas and no further water rights can be allocated in the Gallatin or Madison watersheds.

**Wastewater Treatment and Reuse** is affected by the types of infrastructure, level of treatment, rate of growth, and current capacity for wastewater treatment, storage and reuse. Given the predicted level of growth in the Big Sky area and the accompanying challenges for wastewater treatment, storage, and reuse capacities, along with increasing densities of individual septic systems, treating wastewater to the limits of technology will create more options for beneficial reuse. Predicted increases in effluent generation necessitate the identification and development of suitable reuse alternatives.

## WATERSHED STEWARDSHIP RECOMMENDATIONS TO THE COMMUNITY

**The vision of the Big Sky Sustainable Water Solutions Forum is:**

*"Big Sky strives to be a model mountain community by protecting and improving water resources, sustaining ecological health of the watersheds, and supporting a vibrant local economy."*

Water Forum stakeholders emphasized that recommended alternatives must sustain the ecological health of the river systems and meet the needs of the growing mountain community. Water Forum stakeholders reached consensus on recommendations for the three water resources focus areas on priorities and actions to address the Big Sky area's water resources challenges. The consensus recommendations meet the vision and goals developed by the Water Forum and are supported by the diverse interests represented by the stakeholders.

**Consensus recommendations for sustainable watershed stewardship in the three water resources focus areas are:**

**Ecological Health of the River Systems:** *A healthy and resilient river system sustained through a principled approach to watershed stewardship that includes human activities and natural processes that maintain and enhance stream, riparian and wetland conditions and connections, ensuring water remains clean and cold.*

**Recommended Priorities:**

1. Watershed Status and Trends Monitoring Program
2. Watershed Status and Trends Dashboard
3. Watershed Restoration and Conservation

**Recommended Actions:**

1. Establish a Watershed Status and Trend Monitoring Program, which will include an expanded water quality monitoring network to track water quality trends, fill identified data gaps, provide baseline information for permitting actions, and identify areas for restoration and conservation activities.
2. Develop a Watershed Status and Trends Dashboard to convey information collected in the Watershed Status and Trends Program to the community.
3. Implement Watershed Restoration and Conservation actions that address water quality impairments and protect the existing high-quality water resources by maintaining connectivity in the hydrologic and biologic systems of the Big Sky area.

**Water Supply and Availability:** *Manage and balance surface and groundwater supplies for a vibrant community sustaining a broad spectrum of uses and values including fisheries, wildlife, recreation, agriculture, municipal and domestic needs.*

**Recommended Priorities:**

1. Groundwater Monitoring and Modeling
2. Strategies for Water Conservation
3. Stormwater Management
4. Wastewater Reuse
5. Mitigation of Water Rights

**Recommended Actions:**

1. Expand Groundwater Modeling and Monitoring to accurately characterize the available water supply in the Big Sky area by generating seasonal outlook reports for groundwater supplies, modeling the impacts of various climate scenarios, modeling various withdrawal amounts, developing real-time data on groundwater and surface water, and developing a water balance to identify “targets” or “triggers” for action.
2. Develop Strategies for Water Conservation to inspire community members to actively engage in water conservation to reduce groundwater withdrawals, maintain instream flows, and build resilience against changing climatic conditions.

3. Improve Stormwater Management to “slow the flow” of water through the system to provide for aquifer recharge and increased late-season streamflows, while also providing resiliency for changing climatic conditions.
4. Expand Wastewater Reuse options that benefit water supply, including Expanding Water Reuse for Irrigation, Developing Water Reuse for Snowmaking, and Investigating Shallow Groundwater Recharge.
5. Develop Mitigation of Water Rights over the long-term. In the near-term, maintain an open dialogue with State agencies and senior water rights holders on water rights adjudication, modifications to the change process, and the potential implications of mitigation.

**Wastewater Treatment and Reuse:** *Develop and implement holistic wastewater and stormwater management, utilizing best available technologies and practices, to meet Big Sky’s long-term community needs and protect and improve the ecological health of the river systems.*

**Recommended Priorities:**

1. Treat Wastewater to the Limits of Technology
2. Address Septic Systems and Small Community Systems
3. Expand Water Reuse for Irrigation
4. Develop Water Reuse for Snowmaking
5. Investigate Shallow Groundwater Recharge

**Recommended Actions:**

1. Treat Wastewater to the Limits of Technology to ensure that wastewater generated in the Big Sky area doesn’t negatively impact the ecological health of the river systems.
2. Address Septic Systems and Small Community Systems, which can contribute significantly higher nutrient loads than advanced centralized treatment systems.
3. Expand Water Reuse for Irrigation on local golf courses and other open spaces, modernize irrigation management, and improve tracking and monitoring of irrigation water to ensure that land applied wastewater is fully consumed by plant uptake and is not inadvertently seeping into the shallow groundwater system and flowing into adjacent streams.
4. Develop Water Reuse for Snowmaking with treated wastewater effluent to support the recreation-based economy and provide for water storage and runoff patterns in sync with the natural hydrologic cycle.
5. Investigate Shallow Groundwater Recharge to augment existing groundwater resources.

In addition to the five areas with consensus recommendations for Wastewater Treatment and Reuse, Water Forum stakeholders discussed the pros and cons of directly discharging treated wastewater effluent into the river systems and the potential for direct or indirect potable reuse. Water Forum stakeholders were unable to reach consensus on where or if these two reuse alternatives should be included on the list of priorities outlined within this watershed stewardship plan.

## EXPECTED BENEFITS OF SUSTAINABLE WATERSHED STEWARDSHIP

The Water Forum's recommendations address challenges associated with supporting a human community and four-season resort in an ecologically sensitive semi-arid mountain environment situated at the headwaters of the Gallatin River and Madison River watersheds. All recommendations for sustainable watershed stewardship support one or more of these key concepts:

**Understand and track the ecological health of river systems:** Detailed understanding of trends and impacts to water quality, water supply, streamflows, groundwater recharge, riparian and wetland health, and instream habitat and fisheries is essential for tracking and evaluating progress.

**Maximize valuable water assets:** Limited groundwater and surface water supplies and properly treated wastewater are considered highly valuable to this headwaters community.

**Slow the flow of water through the watershed:** Having sufficient water available during low-flow times of the year is essential for both the ecological health of the river systems and community health. This requires methods for slowing the flow of water through the groundwater, surface water and stormwater systems.

**Address existing impacts:** Ongoing development, current and past land-use practices, and impacts from increasing recreational pressures have negatively impacted water quality, riparian and wetland health, and instream habitat and fisheries in some areas. Addressing these impacts and changing future management and community norms is critical to meeting stakeholder goals.

**Preserve and enhance high quality water resources:** Maintaining and enhancing stream, riparian and wetland areas and ensuring the prevention of further cumulative impacts, will help maintain water quality, fisheries, wildlife and scenic values, and support the recreation-based economy.

## WATERSHED STEWARDSHIP PLAN IMPLEMENTATION

To implement the Water Forum's recommendations for the Big Sky area, partners at all levels will need to commit to work together. Ongoing coordination and increased organizational capacity will be necessary to accomplish the goals of this watershed stewardship plan and estimated funding requirements for implementation are included in **Table E-1**.

### Recommendations for Implementation include:

1. Specific working groups of community partners that coordinate to accomplish recommendations
2. Immediate priorities to work on include expanding the monitoring network, developing wastewater reuse alternatives, improving water conservation, and enhancing community engagement
3. Establishment of long-term sustainable funding to support necessary coordination, monitoring, outreach, and project implementation

Table E-1. Estimated Funding Requirements for Watershed Stewardship Plan Implementation

Focus Area	Quick Start (2018) (1 Year)	Short-term (2019-2023) (5 Years)	Mid-term (2024-2028) (5 Years)	Long-term (2029+) (5+ Years)
<b>Ecological Health of River Systems</b>				
Watershed Status and Trends Monitoring Program	0-100	500-1,000	500-1,000	500-1,000
Watershed Status and Trends Dashboard	0-100	500-1,000	0-100	0-100
Watershed Restoration and Conservation	0-100	500-1,000	1,000+	1,000+
<b>Water Supply and Availability</b>				
Groundwater Monitoring and Modeling	0-100	100-500	100-500	100-500
Strategies for Water Conservation	0-100	100-500	100-500	100-500
Stormwater Management	0-100	100-500	100-500	1,000+
Mitigation of Water Rights	0	0-100	100-500	100-500
<b>Wastewater Treatment and Reuse</b>				
High Treatment Levels for Treated Wastewater	0-100	1,000+	1,000+	1,000+
Address Septic Systems and Small Community Systems	0-100	100-500	100-500	1,000+
Expand Water Reuse for Irrigation	0-100	500-1,000	500-1,000	100-500
Develop Water Reuse for Snowmaking	0-100	1,000+	1,000+	1,000+
Investigate Shallow Groundwater Recharge	0	0-100	0-100	100-500
<b>Total</b>	<b>0-1,000</b>	<b>4,400-8,200+</b>	<b>4,500-7,700+</b>	<b>6,000-8,600+</b>
<b>Annual</b>	<b>0-1,000</b>	<b>880-1,640+</b>	<b>900-1,540+</b>	<b>1,200-1,720+</b>
Funding requirements estimated in dollars x1,000	0-100	100-500	500-1,000	1,000+