

**Comparative Analysis
of Yellowstone River Cultural Inventory
2006–2018**

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Acronyms

CEA	Cumulative Effects Analysis
COE	(US Army) Corps of Engineers
DNRC	(Montana) Department of Natural Resources and Conservation
YRCDC	Yellowstone River Conservation District Council
YRCI	Yellowstone River Cultural Inventory

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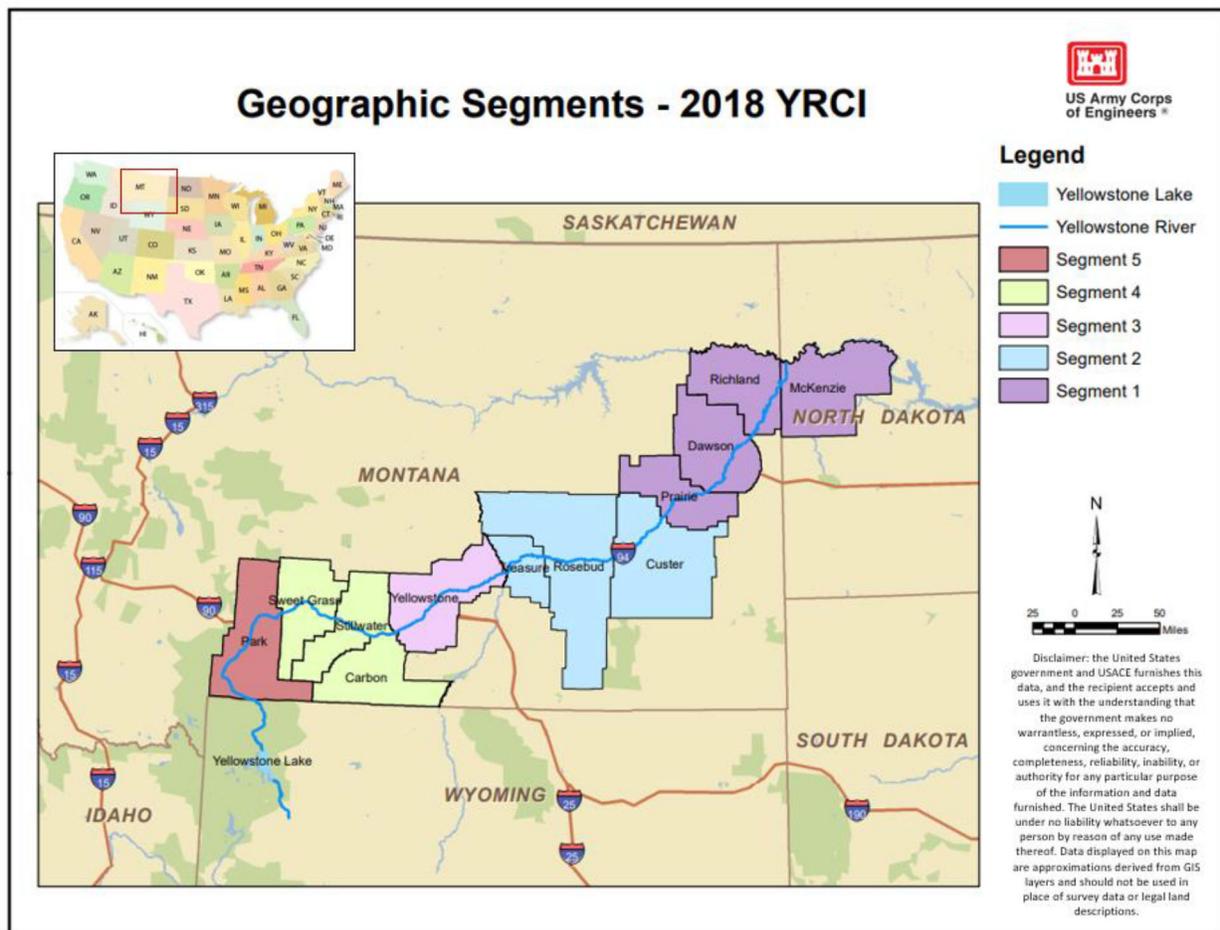
Section 1: Introduction

The Yellowstone River Cultural Inventory and the Participants

In 2006, our research team engaged in lengthy conversations with over 300 individuals from the Yellowstone River Valley. Our project, the Yellowstone Cultural Inventory, was designed to capture the many ways that the people of the valley explained their concerns regarding the river, its resources, and its management. The original work was co-sponsored by the United States Army Corps of Engineers (COE), the Montana Department of Natural Resources and Conservation (DNRC), and the Yellowstone River Conservation District Council (YR CDC).

The design of the original work paid attention to geographic communities, which were defined as: Segment I (confluence with the Missouri River to confluence with the Powder River), Segment II (confluence with the Powder River to confluence with the Big Horn River), Segment III (confluence with the Big Horn River to Laurel), Segment IV (Laurel to Springdale), and Segment V (Springdale to Gardiner).

Figure 1. Yellowstone River Cultural Inventory Geographic Segments.



Each Geographic Segment had defining characteristics:

Segment I: Working from the confluence with the Missouri River towards the west, the first geographic segment was defined as Missouri River to Powder River. This geographic segment included some of the least populated regions of the entire United States. In this segment, the river is broad and relatively slow-moving, serving an expansive farming community that blends the interests of Montanans and North Dakotans. In 2006, this segment was grappling with concerns regarding habitat and fish passage for paddlefish (*Polyodon spathula*) and Pallid sturgeon (*Scaphirhynchus albus*). Prairie, Dawson, and Richland Counties of Montana were included in this segment, as was McKenzie County, North Dakota.

Segment II: The second Geographic Segment, Powder River to Big Horn River, was delineated to include the inflows of the Big Horn and Tongue Rivers as major tributaries to the Yellowstone River and to include the characteristics of the warm-water fishery. This segment was delineated to recognize the significant agricultural activities of the area and the historical significance of the high plains cowboy culture. This segment included Treasure, Rosebud, and Custer Counties.

Segment III: By 2006, Billings, known as a regional center for agriculture, business, healthcare, and tourism, was notable for its loss of agricultural bottomlands to urban development. Because of its complexity as the only segment with a rural-urban interface, the third Geographic Segment, Big Horn River to Laurel, only included Yellowstone County. A further consideration for limiting this segment in this manner were the irrigation out-takes that divert water to projects east of Billings, especially in the communities of Shepherd, Huntley, and Worden. Furthermore, this segment contains the transition zone from cold-water to warm-water fishery.

Segment IV: The fourth segment, was defined as Laurel to Springdale, ending at the northeastern edge of Park County. The river in this area was known as fast-moving and supportive of cold-water fishes. While there was little urban development in this segment, there were some rather obvious landscape transformations where agricultural activities were being converted to amenity landscapes, home sites for retirees and vacationers. The Geographic Segment included Sweet Grass, Stillwater, and Carbon Counties.

Segment V: The last Geographic Segment was defined as Springdale to the boundary with Yellowstone National Park at the town of Gardiner. This segment was entirely within the boundaries of Park County. This segment is noted for its tourism amenities including recreation of fly-fishing and rafting. Severe floods in 1996 and 1997 had caused this county to spend many hours in public debates concerning river management.

Within the Geographic Segments, individuals were recruited to represent four interest groups. The interest groups were used to ensure the study had a diversity of perspectives and an evenness of the voices represented in our analysis and the report. Rarely do people fit one category—for example a mayor (civic leader) may also farm (agriculturalist)—but the categories helped recruit

participants who represent a range of perspectives in the valley (Hall et al. 2012). Recruitment was approached somewhat differently for each group. From the original report, recruitment was explained as follows:

Agriculturalists: Individuals representing agricultural interests included farmers and ranchers, who were identified and recruited from referrals provided by the local Conservation Districts, the Yellowstone River Conservation District Council, and the Montana Department of Natural Resources and Conservation.

Civic Leaders: Individuals holding civic leadership positions, including city mayors, city council members, county commissioners, floodplain managers, city/county planners, and public works managers, were identified through public records and recruited via phone calls.

Recreationalists: Individuals who use the Yellowstone River for recreational purposes—including hunters, fishers, boaters, floaters, campers, hikers, bird watchers, rock hunters, photographers, and others who use the river for relaxation and serenity—were identified and recruited from referrals provided by members of the YRCDC Resource Advisory Committee. Participants were also identified and recruited by contacting various non-governmental organizations such as Ducks Unlimited, Trout Unlimited, and the Audubon Society and by contacting local fishing and hunting outfitting businesses.

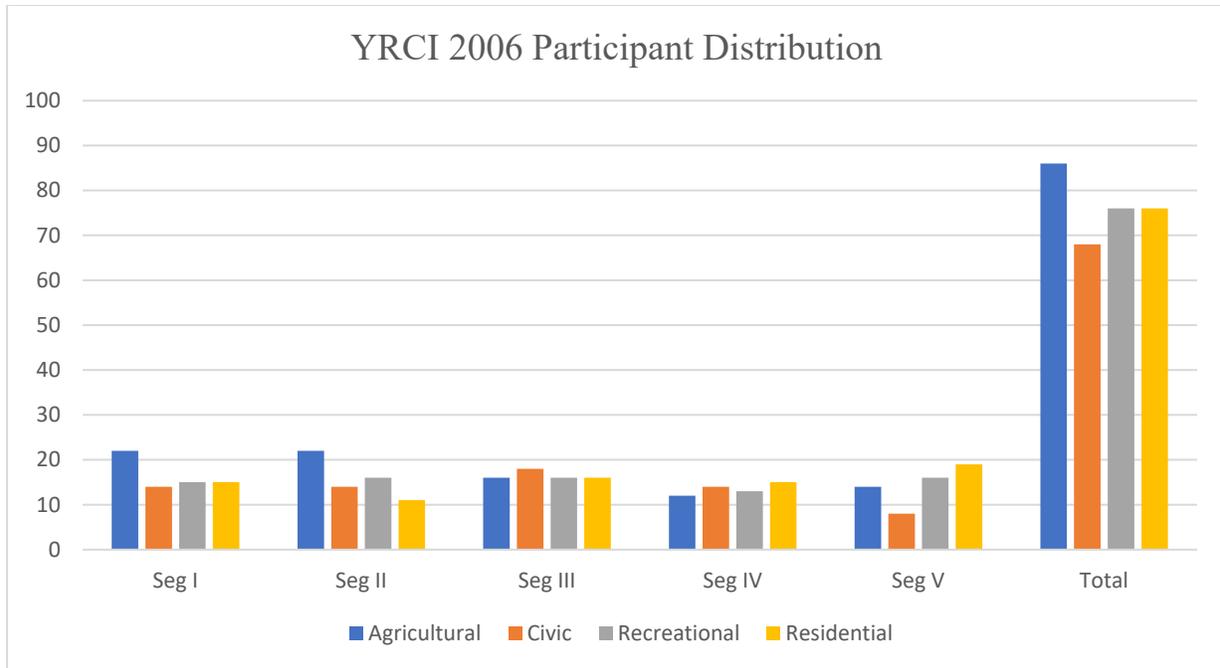
Residentialists: The names of property owners holding 20 acres or less of land bordering the Yellowstone River, or within 500 feet of the bank, were obtained through a GIS search of public land ownership records. Twenty acres was used as a screening threshold to separate the people who lived along the river corridor but whose incomes were from something other than agricultural practices (residentialists) from those who were predominantly farmers or ranchers (agriculturalists). The names were sorted by county and randomized. Recruitment proceeded from the randomized county lists. Other people living very near the river, and whose primary incomes were not generated by agriculture, were also recruited. These additional participants may not have had property that technically bordered the river and/or they may have owned more than 20 acres. In all cases, the recruits did not consider agricultural as their main source of income.

For the purposes of the 2006 study, American Indians from the Crow and Northern Cheyenne tribes were included. They were recruited primarily by means of referrals from state agency personnel and Yellowstone River Conservation District Resource Advisory Committee members. The 2006 efforts yielded interviews with over 300 individuals (see Table 1).

Table 1. Participants in Yellowstone River Cultural Inventory–2006						
	GEO SEG I: Missouri River to Powder River	GEO SEG II: Powder River to Big Horn River	GEO SEG III: Big Horn River to Laurel	GEO SEG IV: Laurel to Springdale	GEO SEG V: Springdale to Gardiner	TOTAL IN GROUP
Agricultural	22	22	16	12	14	86
Civic leaders	14	14	18	14	8	68
Recreation	15	16	16	13	16	76
Residents	15	11	16	15	19	76
Geographic Segment TOTAL	66	63	66	54	57	
Crow & Northern Cheyenne Tribes						7
PROJECT TOTAL						313

The 2006 interview protocol employed open-ended interview questions that encouraged a conversational atmosphere and that allowed participants to put their thoughts into their own words (see Appendix A). Comprehensive summary reports of the 2006 data are reported elsewhere (Gilbertz, Horton, and Hall 2006a-e). Overall representation by Segment and Interest Group are illustrated below (see Figure 2).

Figure 2. YRCI 2006 participant distribution by segment and interest group.



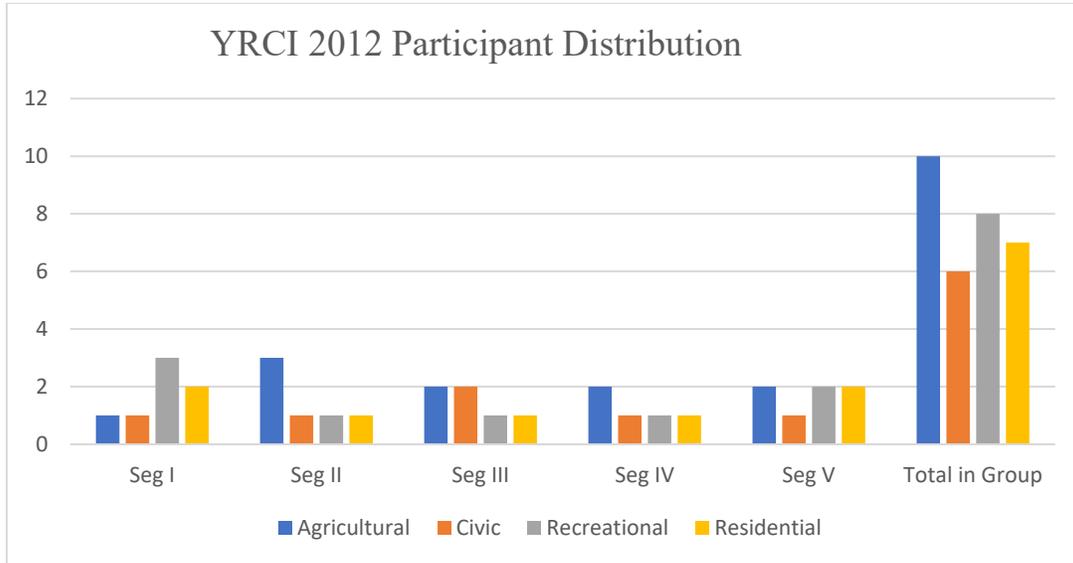
Importantly, the initial 2006 approach has since served as the foundation for two follow-up field seasons. In 2011, the spring high water resulted in flooding and an oil spill near the town of Laurel. The research team returned to the field in the early spring of 2012 to gather additional interview data, hopefully data that would reveal any shifts in the local conversations since 2006. The original structure of participants was maintained, albeit in a much-abbreviated scale (see Table 2).

	GEO SEG I: Missouri River to Powder River	GEO SEG II: Powder River to Big Horn River	GEO SEG III: Big Horn River to Laurel	GEO SEG IV: Laurel to Springdale	GEO SEG V: Springdale to Gardiner	TOTAL IN GROUP
Agricultural	1	3	2	2	2	10
Civic leaders	1	1	2	1	1	6
Recreation	3	1	1	1	2	8
Residents	2	1	1	1	2	7
Geographic Segment TOTAL	7	6	6	5	7	31

Some new participants were recruited in 2012, especially individuals impacted by the oil spill. The protocol was adapted slightly so that conversations about the floods and oil spill could emerge as natural elements of the interviews (see Appendix A). Lacking formal linkages to tribal communities, follow-up interviews with American Indians were not included in the 2012 effort.

Even though the 2012 effort engaged many fewer people, attention to Interest Group and Graphical representation was maintained (see Graph 2).

Figure 3. YRCI 2012 participant distribution by segment and interest group.



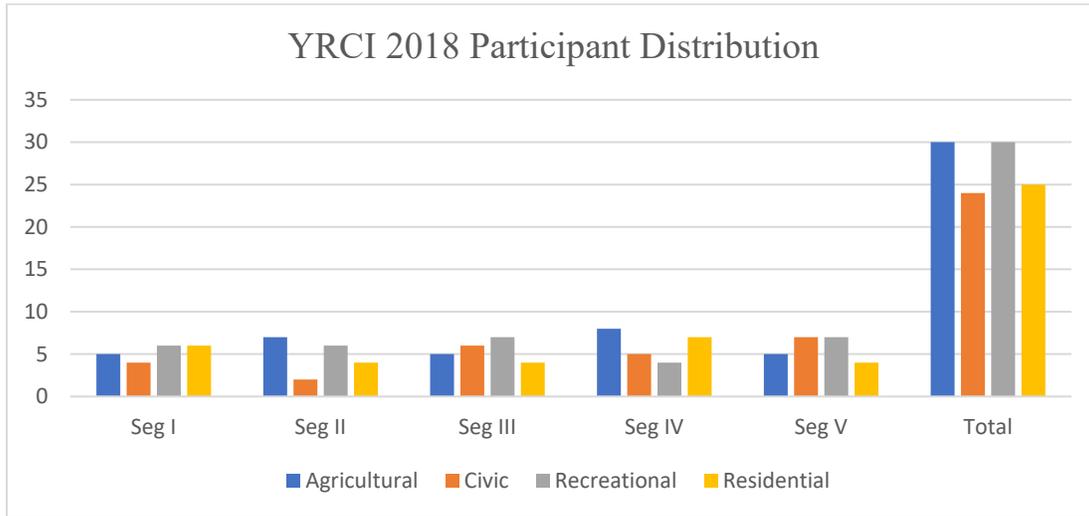
The summary reports of the follow-up 2012 findings are also available to the public (Gilbertz, Emerson, and Hall 2020).

By 2018, the context had changed yet again. Ice had scoured the river bottom near Glendive causing another pipeline rupture in 2015. In 2016, a fish-kill in Paradise Valley was thought to be the result of higher-than-usual river temperatures. And, even though spring flooding in 2017 impacted several communities, a few weeks later the valley entered one of the driest years on record. More than 100 participants were interviewed in 2018 (see Table 3).

	GEO SEG I: Missouri River to Powder River	GEO SEG II: Powder River to Big Horn River	GEO SEG III: Big Horn River to Laurel	GEO SEG IV: Laurel to Springdale	GEO SEG V: Springdale to Gardiner	TOTAL IN GROUP
Agricultural	5	7	5	8	5	30
Civic leaders	4	2	6	5	7	24
Recreation	6	6	7	4	7	30
Residents	6	4	4	7	4	25
Geographic Segment TOTAL	21	19	22	24	23	109

Again, follow-up interviews with American Indians were not included in the 2018 effort. The protocol was slightly adapted again (see Appendix A). Interest Groups and Geographical representation were attended (see Graph 3), and the summary report of the 2018 data is completed (Gilbertz, et. al. 2021, forthcoming).

Figure 4. YRCI 2018 participant distribution by segment and interest group.



Taken as a whole, participation in the three field season efforts resulted in 453 interview participants (see Table 4).

	SEG I: Missouri River to Powder River	SEG II: Powder River to Big Horn River	SEG III: Big Horn River to Laurel	SEG IV: Laurel to Springdale	SEG V: Springdale to Gardiner	TOTAL
2006	66	63	66	54	57	313
2012	7	6	6	5	7	31
2018	21	19	22	24	23	109
TOTAL	94	88	94	83	87	453

Some individuals participated in more than one interview over the three field seasons. Below, we show the 61 individuals who were interviewed in 2006 and 2018 (see Table 5). We refer to individuals who participated more than once as Recurring Participants. Below we illustrate the distributions of the Recurring Participants per Interest Group (see Graph 4) and per Geographic Segment (see Graph 5).

Table 5. Recurring Participants in Yellowstone River Cultural Inventory–2006 & 2018						
	GEO SEG I: Missouri River to Powder River	GEO SEG II: Powder River to Big Horn River	GEO SEG III: Big Horn River to Laurel	GEO SEG IV: Laurel to Springdale	GEO SEG V: Springdale to Gardiner	TOTAL IN GROUP
Agricultural	3	4	3	6	1	17
Civic leaders	1	0	4	2	1	8
Recreation	3	5	4	1	5	18
Residents	5	2	2	6	3	18
Geographic Segment TOTAL	12	11	13	15	10	61

Figure 5. Recurring participants per in 2006 and 2018, by interest group.

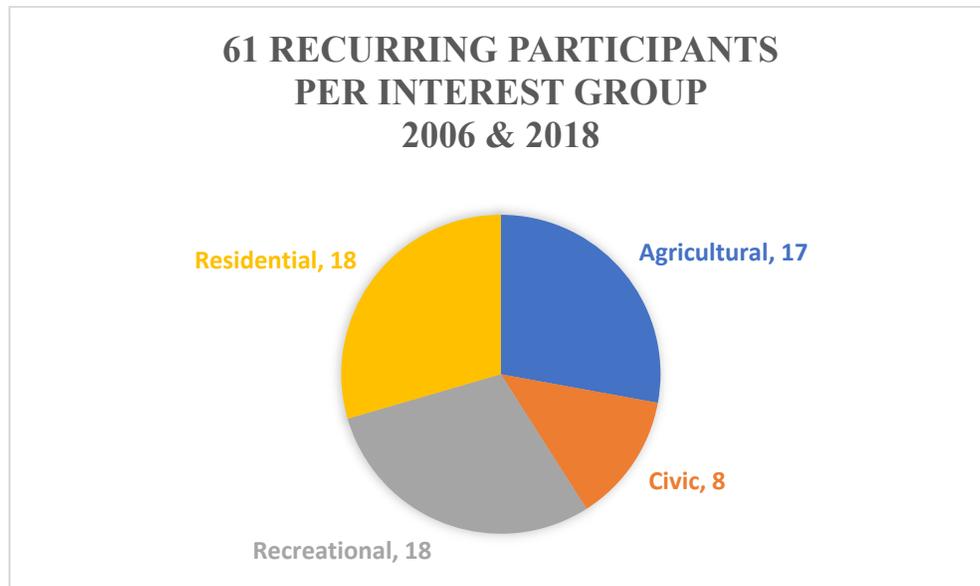
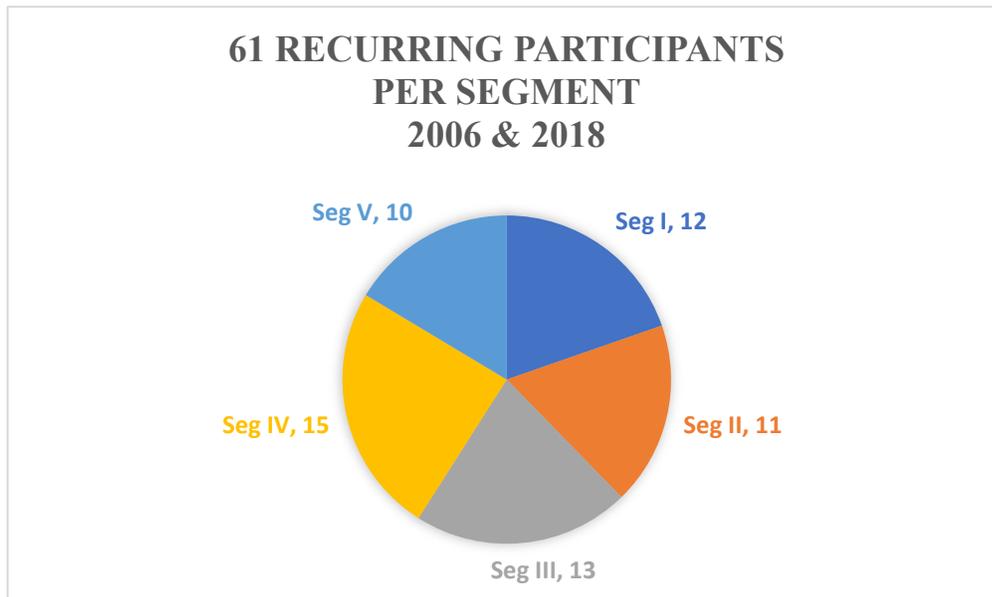


Figure 6. Recurring participants per in 2006 and 2018 by Geographic Segment.



The field efforts also resulted in 15 participants who were interviewed in 2006, 2012, and 2018 (see Table 6, Graph 6, and Graph 7). We refer to this group as the 15 Recurring Participants.

	GEO SEG I: Missouri River to Powder River	GEO SEG II: Powder River to Big Horn River	GEO SEG III: Big Horn River to Laurel	GEO SEG IV: Laurel to Springdale	GEO SEG V: Springdale to Gardiner	TOTAL IN GROUP
Agricultural	1	2	0	2	1	6
Civic leaders	0	0	2	0	1	3
Recreation	0	1	1	0	1	3
Residents	1	0	0	1	1	3
Geographic Segment TOTAL	2	3	3	3	4	15

Figure 7. Recurring participants per in 2006, 2012, and 2018 by Interest Group.

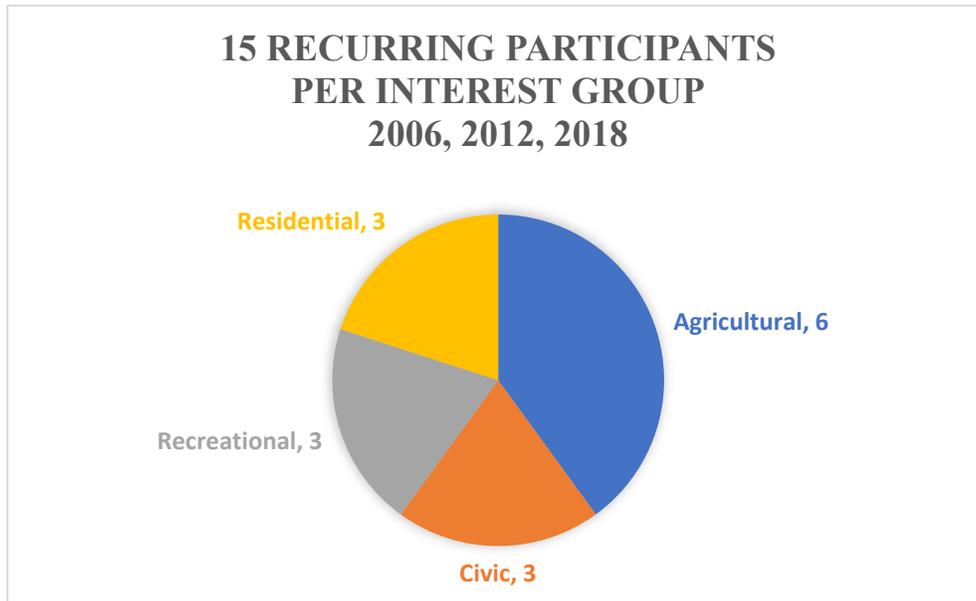
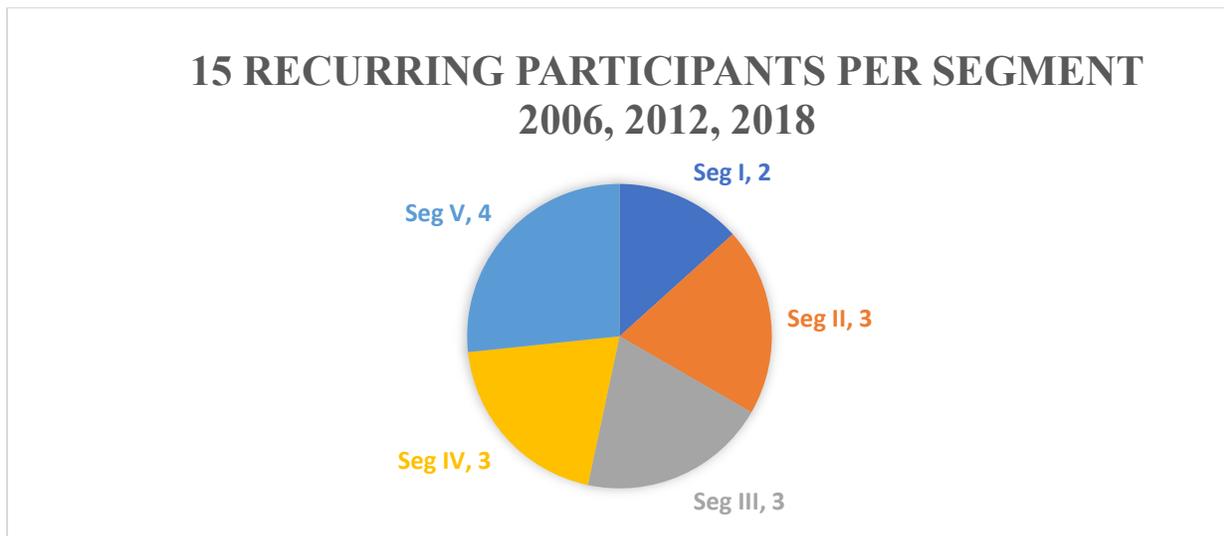


Figure 8. Recurring participants per in 2006, 2012, and 2018 by Geographic Segment.



Structure of the Report

The effort reported here explores the longitudinal character of the data generated over the three field seasons: 2006, 2012, and 2018. The analysis required considerable reading and re-reading

of approximately 4,000 pages of interview transcripts to identify patterns and themes useful to river management and riverfront life. In each of the YRCI reports (Gilbertz et al., 2006, 2020, 2021), we aimed for the voices of the participants to speak louder than the researchers' voices. As such, we evidence each theme with participants' verbatim quotes and arrange the order of those quotes based on what we most frequently heard to least often heard. In our previous field season reports, we located common themes, topics, and representations for each interest group focusing on one geographic segment at a time. Here, we put them together in a comparative and synthetic report organized by theme. The aim is a comprehensive report useful to water resource and natural resource managers, civic leaders, state policy makers, and Yellowstone River enthusiasts. While comparative points are endless in their possibilities, we have focused our attention on comments regarding 10 vital aspects of river management.

Section 2: The Beautiful and Dynamic Yellowstone River. This section includes comments about the power of the river, comments about flooding, and comments about erosion.

Section 3. Bank Stabilization: Should We, or Shouldn't We? This section begins an in-depth analysis of discussions of regarding attempts to control the river. We illustrate that there is no consensus regarding bank stabilization projects, as some participants explain that stabilization efforts might not be a good idea.

Section 4. Bank Stabilization: How We Do It. Section 4 continues the analyses of conversations regarding bank stabilization by highlighting comments about the various stabilization methods. Riprap is an important topic of conversation, as are Bendway weirs, and vegetation as an alternative.

Section 5. Bank Stabilization: Decisions and Consequences. Section 5 completes the review of stabilization by illuminating additional factors that individuals consider when deciding if they will attempt to stabilize a riverbank on private property. Expressed understandings include discussions of potential unintended consequences.

Section 6. Dikes, Floodplains, and Development. This section illustrates how dikes, levees, floodplains, and riverfront development are intertwining conversations among locals. These topics are especially important in communities that are protected by levees and/or where riverfront development was, or is more recently, prevalent.

Section 7. Intake and Other Dam Ideas. Section 7 presents comments regarding the Intake irrigation facility, Pallid sturgeons, and worries about water storage.

Section 8. Riparian Areas and Cottonwood Forests. Here, we include comments that illuminate local understandings of riparian areas. These conversations were prompted, at times, by questions about the river corridor. In 2018, interviewers put extra effort into finding out how the participants described the cottonwood forests.

Section 9. Understandings of Management. Section 9 exposes locals views of various governing agencies and regulatory processes.

Section 10. Analyses of 15 Recurring Participants. Lastly, Section 10 provides a detailed examination of the data derived from a select group of participants: 15 Recurring Participants (individuals who were interviewed in each of the three field seasons: 2006, 2012, and 2018). Our discussion at the end of Section 10, explains the value of longitudinal cultural data for river managers.

Limitations of the Findings

Qualitative investigations have a very distinctive character which defines how the findings can be used. By allowing participants to put their concerns in to their own words, we illuminated and approximated conversations that were likely being held in backyards, local coffee shops, grain elevators, and city council chambers. In a sense, the interviews functioned to “overhear” what is being talked about and what is being said in the local communities. Importantly, the participants were not randomly selected. They were targeted as individuals who we believed were likely to offer good insights and/or who were known to be actively involved in commenting on river issues. Further, the participants were self-selecting—they had to agree to spend at least 30 minutes with one or two people from our research team (Hall et al. 2012, Horton et al 2016). Thus, the findings should not be construed as representing public opinions writ large. Instead, the data reveals patterns of conversation, among and across interest groups, Geographic Segments, and time. As examples of the local vernacular (Jackson, 1984), the comments are reported in the following sections in terms of topics and themes.

While reading the upcoming sections please remember the differences in the *amount of textual data* from season to season cannot be interpreted as meaningful in and of itself. The varying scales of the field efforts were a function of funding and the availability of team members. Clearly then, with over 300 participants in 2006, those interviews resulted in the largest data set. However, meaningful comments were gathered from the 31 individuals interviewed in 2012 and from the 100-plus individuals who participated in 2018. In presenting the findings we have sometimes gathered a few comments from all three field seasons together, thus allowing a quick glance at how the conversations change or remain the same over time. In other cases, we have created sub-sections for each field season. Most often, we have combined the few available comments from 2012 with comments from 2018 to serve as a comparative set to the 2006 comments.

Overview of Findings

Section 2: The Beautiful and Dynamic Yellowstone River

Over twelve years, some perspectives remained consistent, especially ones regarding the aesthetic qualities and the power of the river. Through the years and across groups, participants mention the trees, the wildlife, and the peacefulness of the river environment as favorite characteristics. In each field season, the dynamic nature of the river was commented on by participants from every Geographic Segment and Interest Group.

The data also exposed the importance of specific flood years as reminders of the river’s power. In 2006, the floods of 1996 and 1997 were generally rolled together as one episode, and later the flooding of 2011 was discussed as another important event. Compared to data from 2006, the major flood events of 1996 and 1997 were spoken of less in 2018.

Across all three field seasons, there remained great disparity of opinions in terms of describing the river as an entity that could be controlled. When erosion was spoken of as a “natural process,” participants might also explain that the river should be “left alone.” Agriculturalists, across all field seasons, were most likely to explain erosion as a “problem,” yet some were not willing to “fight” the river.

By 2018, a few people used the term channel migration to describe what they witnessed. Notably, this term was not discovered in local vernacular descriptions prior to 2018.

Section 3. Bank Stabilization: Should We, or Shouldn’t We?

Across all field seasons, there was no consensus regarding which bank stabilization technique—riprap, bendway weirs, jetties, barbs, bank sloping, and others—is most effective or appropriate. Many landowners near the river expressed desires for better “rights” when deciding how to manage their properties. People in favor of bank stabilization projects explain that they place a high value on the assets such as farmland, infrastructure, houses, and recreation. They further explain that they hope to “protect” these assets, and they question whether the people against bank stabilization understand the consequences.

Others describe stabilization as simply causing more problems, and they believe it is best to let the river flow naturally. These folks sometimes explain that those who do not appreciate the free-flowing river should not have property along it. They argue that living near the river is best, when we allow the river room to “rampage.” Some participants described projects that they questioned were legal based on current permitting requirements. These projects included using construction debris, mostly discarded broken concrete slabs. Many explained that car bodies work exceptionally well for stabilization, and some did not see a problem with their use. In 2006, some participants were against bank stabilization simply for aesthetic reasons. They indicated they preferred “subtle” solutions. Similarly in 2018, some of those opposed to stabilization explained if stabilization projects looked more “naturally appealing,” they would object less to stabilization practices.

Nuances in the conversations regarding bank stabilization were found in each field season, meaning that more than a few of the participants suggested they could see tensions between desires to protect properties and the need to protect public interests. They were quick to indicate that there was not a simple answer when considering how to balance those competing needs.

Section 4. Bank Stabilization: How We Do It

Among landowners, and across all field seasons, it was easy to solicit comments about bank stabilization practices. From riprap to jetties and barbs, to natural vegetative solutions, landowners had clear opinions about effectiveness.

In 2006, many landowners simply described what they have done to their property, and several explained that using the large rocks had been the most effective and longest lasting method. Some landowners spoke highly of Bendway weirs. They explained the weirs were less expensive and more aesthetically pleasing. Some mention that weirs are good for fisheries. However, they cautioned that they must be installed correctly and can still disappear during high water. Some claimed that vegetative alternatives are better in terms of the health of the system and that they work well. Others claimed these “soft” alternatives did not work, especially because beaver can easily destroy years of efforts. Finally, some attributed erosion problems to stabilization and development projects upstream.

In 2018, participants similarly claimed that they had mixed results using vegetation for stabilization. Some said that the best solution was to use a mix of riprap and vegetation. They explained this technique was able to protect nature, and they believed it to be a more long-term solution as compared to other methods.

Throughout the three field seasons, civic leaders and recreationalists added to the comments. They often mentioned projects that were likely done without permits, or projects that would no longer be permitted (car bodies and scrapped concrete slabs). At times, it is a comical conversation that emphasized a “can-you-believe-it” interpretation of what people have tried to stabilize banks. At the other times, the participants were more matter of fact, leaving interviewers and analysts to wonder if the descriptions are subtle endorsements. More often, participants expressed their disdain for these “out-of-date” approaches, and they said they were supportive of regulations that resulted in “natural” bank stabilization solutions.

Notably, in 2018, one participant claimed a lack of understanding regarding why concrete blocks were no longer allowed.

Section 5. Bank Stabilization: Decisions and Consequences

Participants identified several concerns and complications that must be considered when contemplating bank stabilization activities. The concerns focused on these questions: Will it work as intended? How long will it last? How much will it cost?

Many participants stated it was extremely difficult to predict how the river would react to different projects. They often cited their own experiences of how bank stabilization projects apparently caused a negative impact down river.

Bank stabilization projects designed to protect public infrastructure—mostly roads and railroads—along the Yellowstone River were identified as the main culprits when discussing the impacts of bank stabilization. Others viewed these large projects as necessary to protect community interests. Some explained that large stabilization projects seemingly happen without the same permitting constraints and timelines experienced by smaller landowners, even though the large projects apparently alter the river in significant ways.

Two concerns were often tied together: costs and longevity. Participants who considered stabilization projects often stated that these two factors were their primary reasons for not pursuing bank stabilization, despite needing such projects to protect property. In 2006 and 2018, stabilization projects were often deemed too expensive.

Another way to “live with” river bank erosion was explained as learning to simply accept it and allow it to happen. Comments in 2012 and 2018 revealed the topic of channel migration easements was becoming of interest among participants; some explained the specific pros and cons of implementing such a program. In each field season, a few participants noted that the only the “wealthy” folks coming to Montana had enough resources to engage in conservation-minded practices.

Section 6. Dikes, Floodplains, and Development

Over the years, the towns of Glendive, Forsyth, Miles City, and Livingston have been faced with increased flood risks related to the conditions of the levees, locally called dikes, that protect these towns. Especially for the local Civic Leaders, problems concerning dike maintenance, integrity, and certification are high priorities. Restoring integrity is understood to be costly, as is flood insurance. Moreover, it is “hard to tell people what to do with their property.” Some residents have come to understand that when trees grow on dikes, they degrade dike integrity. The quotes demonstrate a progression from “Why can’t you leave the trees?” to a better understanding of the need to protect integrity. Yet, a persistent sense of security is expressed regarding local levees.

In each field season, civic leaders expressed strong opinions about the floodplain maps and regulations. Floodplain maps are controversial due to uncertainty. Several participants indicated they were “not sure” if they lived in a floodplain. Civic leaders were the mostly likely to discuss the maps as necessary and—when accurate—useful for the purposes of designing regulations. Some called for better maps. Framed as governmental interference with private property rights, some participants question why the maps change and why the rules seem to be getting stricter. Many were concerned about the security associated with dikes and levees under new regulations.

Since 2006, locals discussed the changes in their local landscapes throughout the valley. Participants reported that new landowners, many from out-of-state and apparently “wealthy,” were building homes and subdivisions closer to the river and on ridgelines. In 2006, these trends were mostly discussed by participants from the upriver Geographic Segments. By 2012 and 2018, those trends were discussed throughout the valley. Ironically, some of the “newcomers” were now concerned about too much development near the river. Some in the local communities were concerned how new residents would advocate for policies that impede local economic development. In 2012 and 2018, the changing landscape and changing notions about how to live with the river continued to generate a wealth of comments. Some thought maybe it was “too late” to control development.

Consistent themes dominated these discussions, including linking levee issues with local economic development, concerns about insurance expenses, private property rights, and governmental intervention. Many advocated a “builder beware” philosophy that would let people

do as they wished, even if the potential for a bad outcome was likely. Others explained that the regulations were needed, and a “win-win” approach was doable.

In 2018, evidence of increasingly positive evaluations of relationship with the COE emerged. By 2012 and 2018, there was a growing understanding that regulations could not move forward as “one size fits all.” Also, in 2018, some conversations are quite specific to local projects and agendas. In Yellowstone County, there are local groups hoping to create a connected trail system to run along the riverfront. These projects are not universally supported among riverfront landowners. As the years passed and changes were noted, locals further understood a need for information and education concerning the river and how regulations could protect resources. By 2018, conservation easements were seen as a way to protect land from development, but the tax deductions were viewed as insufficient compensation and the program “too permanent.”

Section 7. Intake and Other Dam Ideas

Discussion concerning diversions dams and water storage were common during all of the field seasons. In Segments I and II, the controversies associated with federal project to build a fish bypass around Intake irrigation diversion dam for the endangered Pallid sturgeon near Glendive were frequently discussed. In 2006, the controversy was relatively new, and reactions were quite visceral as farmers felt threatened by the push to secure passage for the endangered Pallid sturgeon and any associated uncertainties to irrigation and land use. Many in the area felt there was not a clear understanding of the importance of agricultural activities. Others wondered if the Paddlefish, popular with anglers, had been given enough attention. Many questioned the motives of “outsiders” involving themselves in local concerns. By 2012, concerns about shutting down irrigation had mostly faded due to the rebuilding of the Intake facility. By 2018, many felt a balanced, even “win-won” solution was in the making.

Interviews in Segments I and II also included discussions of Yellowtail Dam (completed 1967) and its impacts on the river downstream from the confluence with the Big Horn River. While communities acknowledged benefits of less-intense flooding, many discussed how regulated flows have changed the fishery. The dam produces electricity for some rural areas, and those participants involved in managing that service discussed balancing the needs of the river with the needs of those who are dependent on the power.

Many in the valley are attentive to the drought cycles. They often explained that while putting dams on the Yellowstone River had once seemed a somewhat viable option, in the 21st Century, the free-flowing river would generate resistance to any serious consideration of dams on the river. Participants wondered aloud how to store “Montana’s” water. Off-stream storage was discussed by some.

Section 8. Riparian Areas and Cottonwood Forests

In designing the original protocol, efforts were made to engage the participants in conversations regarding riparian areas, however it was assumed that the term was not a locally used vernacular term. We attempted to elicit comments that might answer these questions: Was “riparian” a term

local residents would introduce into the conversation? What do participants use to express understandings of riparian areas? Moreover, did they attach any value to riparian areas?

To avoid using the term riparian, we decided to solicit conversations about the “river corridor.” The results were not always successful in terms of soliciting discussions about riparian areas. Indeed, for some, the term “corridor” had political connotations. Participants worried about how wide the corridor boundaries might be: A quarter of a mile? Five miles? They offered opposing opinions concerning whether or not restricting activities in the corridor was a good idea. By 2018, the conversations concerning corridors were much the same, however a few people described the corridor as an interface, or as an expanse where the river could migrate.

In 2006, discussions that could be categorized as fitting a riparian theme were obvious, and some participants introduced the term into their explanations. There was much attention to wildlife, birds, and some mention of ecosystems. Some of the participants explained that livestock grazing was detrimental to these areas. In 2012 and 2018, the conversations were not much different; however, once participant explained that the riparian area could filter water.

During each of the field seasons, the cottonwood (*Populus* spp.) forests, in riparian areas, were described as beloved. In 2006, participants claimed that livestock and wildlife inhibit cottonwood growth. In 2012, some blamed reduced cottonwood health on other factors, such as human impacts, temperature changes, and disease. In 2018, the team put extra effort into soliciting comments regarding cottonwood forests, and found that out of love or worry for, there was a general awareness that the cottonwood forests were “aged.” Some speculated that grazing, beavers, squirrels, and erosion were detrimental to cottonwood health. Participants explained that cottonwoods need “a lot of water.” Some noted that sapling cottonwoods appeared after flood water recede, yet no one suggested more flooding as a means of enhancing cottonwood regeneration.

Section 9. Understandings of Management

Concerns about river management regulations and the administering thereof were quite common across field seasons. For acquiring bank stabilization permits, many participants explained the permitting process as time-consuming and extensive. Participants voiced concerns and some confusions about the various agencies that needed to be involved, but the COE was noted as the “ultimate arbitrator,” with a great deal of power.

Even so, in 2006, some participants described positive experiences with the regulatory process as well. While they found the permitting process lengthy and expensive, their overall experience dealing with the various agencies was positive. Some expressed gratitude that they were grandfathered into their stabilization projects. Other 2006 participants, made specific comments about their understanding of new regulations requirements expressing dismay with the lack of information concerning new rules.

In 2012, participants from Segment V commented on their confusion with the Special Area Management Plan (SAMP) and the Governor’s Task Force, and in 2018 some described a shift, noting that the COE was a lot more involved in general river management than previous years.

Despite the grumblings from some participants, in each field season, there were other participants with positive, or at least neutral, things to say about the COE. Participants offered suggestions for improved management. In 2006, many participants described gaps in management or a lack of understanding. By 2018, comments from participants had shifted toward wanting proactive programs.

Section 10. Analysis of 15 Recurring Participants

Having gathered data during three different field seasons, spanning 12 years, we had the opportunity to explore these data via an additional mode of analysis. Fifteen individuals participated in the project in each of the field seasons: 2006, 2012, and 2018. We refer to these participants as the 15 Recurring Participants (RPs), and we approached their interview data as a unique sub-set of the 12-year effort as a longitudinal panel interview study.

Although we used the same interview protocol during each field season, the open-ended questions allowed participants to shape the conversations in light of recent events. The findings echo and reinforce trends identified in the above sections. Here, though, an important additional insight is disclosed. Namely, when place-based/experience-based stories anchor individuals' understanding of river processes and management, those stories can function to hinder or enhance the individual's ability to incorporate new information into their personal discourse.

The Gorilla in the Room: Climate Change

In 2006, the research team agreed to never use the terms “climate,” “climate change,” or “global warming” during the interviews for fear those terms might cause participants to react to the interview as “political” in nature. Yet, by 2018 these terms were *introduced by participants*, typically when asked, “Have you noticed any changes?” There were few such moments. Yet, their appearance in the 2018 interview texts suggested that each interest group had begun to incorporate these terms into vernacular conversations. Recreationalists from Segments IV and V offered these comments in 2018:

The other thing that has probably been the biggest change that I've seen in those 30 years has been the effects of climate change. That kind of the gorilla in the room that almost everything else kind of seems to fall, follow from that. I think one of the things we've seen in terms of the fishing certainly, the changes that we've seen is certainly, I guess in technical jargon, the flow regimes. We're just seeing real changes, and typically over those 30 years, you know, smaller runoffs, earlier runoffs, so certainly the seasonal changes. (Recreationalist, Segment IV, 2018)

Back in those days, lots and lots of phone calls from people saying, ‘When should I come to Montana?’ And the answer I gave them in 1995, is not the answer I would give them now. We certainly, typically, have more dependable fishing in the spring and the fall, [but] now, in the last few years, it's been pretty typical for runoff to be starting early.... I

think the major thing in terms of climate change on the river is we've just had overall less water, we've had less snowpack, you know, the runoff is shifting earlier. The PKD outbreak in August in 2016 was certainly the most extreme event.... I only lost three days of work... I certainly didn't anticipate the PKD outbreak... but I anticipated low water and warm water and slow fishing... [Due to the] Hoot Owl Closures.... we book March, but we don't book August. So that's, you know, that's a pretty dramatic change. (Segment V, Recreationalist, 2018)

By 2018, climate change was used to explain personal experiences and recollections of physical feature changes and events.

Section 2: The Beautiful and Dynamic Yellowstone River

Over twelve years, some perspectives remained consistent, especially ones regarding the aesthetic qualities and the power of the river. Through the years and across groups, participants mention the trees, the wildlife, and the peacefulness of the river environment as favorite characteristics. In each field season, the dynamic nature of the river was commented on by participants from every Geographic Segment and Interest Group.

The data also exposed the importance of specific flood years as reminders of the river's power. In 2006, the floods of 1996 and 1997 were generally rolled together as one episode, and later the flooding of 2011 was discussed as another important event. Compared to data from 2006, the major flood events of 1996 and 1997 were spoken of less in 2018.

Across all three field seasons, there remained great disparity of opinions in terms of describing the river as an entity that could be controlled. When erosion was spoken of as a “natural process,” participants might also explain that the river should be “left alone.” Agriculturalists, across all field seasons, were most likely to explain erosion as a “problem,” yet some were not willing to “fight” the river.

By 2018, a few people used the term channel migration to describe what they witnessed. Notably, this term was not discovered in local vernacular descriptions prior to 2018.

Aesthetics: Home to Cottonwoods and Wildlife

It's the Best—2006

Well, it's probably the best part of the United States. Probably one of the best rivers in the United States.... The brush, and the trees, and the things along the river that...I grew up with.... I guess, I take them for granted, maybe. But it's the best part of the river, you know. (Segment I, Agriculturalist, 2006)

It is pretty spectacular in terms of what you can see. You will have stretches from here to the confluence, and...it is back-to-back cottonwoods.... [Then] there are some really nice cliffs by Pompey's.... The Missouri is considered wild and scenic, but it doesn't change as much.... [The Yellowstone has] much more diversity. You can see agricultural things, pretty farm fields, islands, and trees... You get out here, and you can look for miles. At Terry, and by the Powder River, with the history of Custer camping there, you can look up in the hills and damn near see it. (Segment I, Recreationalist, 2006)

For me, the river is just nice to look at. And, in the fall of the year, I drive too slow because I'm always looking, watching the trees change. And there were times I drove too fast [because] I was looking at trees changing. And then, I looked in the rear-view mirror and I saw these flashing lights.... When he comes up, he says, 'You're going too fast.' And, I said, 'Where did you come from?' He said, 'I met you, didn't you see me?' I said, 'No, I was 'in the fall.'" The trees are beautiful along the river about that time. When

the ash are starting to turn gold, and the cottonwood are still green, and then you got the yellows, and I was just...gawking. (Segment I, Agriculturalist, 2006)

It's...where all the life is. There's pelicans, deer, blue heron. Oh, there's little dippers, killdeers, horned toads. Just a lot of things to see, especially this time of year. Pretty soon the yucca plants will be blooming because it was kind of a wet year. In the spring, quite a few wildflowers come out...[And] there's an asparagus patch.... I think there used to be more of the...blue herons. There used to be quite a few of them right across from where that asparagus patch is.... And then, the hawks, you know, the red-tailed hawks.... When you get near their territory, they'll take off and they'll circle, and they'll screech at you. I always like to hear that noise. The geese are always talking. So, it's just an alive place. (Segment I, Recreationalist, 2006)

I don't like Billings and all of the box stores and the pavement. Bottomland is the most important thing for agriculture. You see all this bottomland being paved over and you know it is going to impact the river. It seems like poor design to me. (Segment II, Civic Leader, 2006)

In fall, you have the colors of the trees...like you do in town, but [by the river] they are all natural.... There are trees that are 100 years old. There are willows and wild grapes. Those are fun. (Segment II, Recreationalist, 2006)

I like the fact that for the most part [the river] is left open to function naturally, that there is still a lot of floodplain left, realizing that it's heavily armored in places.... The floodplain is essentially storage for flows that are above normal flows. Without adequate storage, it would be discharged downstream and have to go somewhere and force itself into places that would probably cause a lot of destruction. So, if you can maintain natural floodplains, then you can pretty much protect property from inundation. (Segment III, Civic Leader, 2006)

Those who are interested in the future of this urban area should be interested in the calling cards to the area, one of which is the river. If you allow a few to own it, you've lost that calling card. Would it suffice for the ecosystem if it were a park? Absolutely, it would, because it's a huge area. Riverfront Park is a pretty good example. It needs a lot more extensions. You can go to many cities—Boise is a good example....and fair amounts of Missoula's Clark Fork are in public ownership.... Their urban area is right on top of it.... The Yellowstone is a beautiful possibility for an open wildlife corridor. (Segment III, Civic Leader, 2006)

Paradise. It's just great, great living. Private and beautiful. We are so lucky and privileged to live here; it's just wonderful. We have about two and a half miles of riverfront, so we don't have any neighbors close, and it is just great.... The river is the reason we are here. It's the whole thing. There is constant action going on at the river, whether it's birds, or fishing, or deer, or whatever. There is always wildlife around which is our great love. We cultivate our land for wildlife. (Segment IV, Residentialist, 2006)

I'd say we've lost...about a half a section.... I'll bet we've lost seven acres, at least, from that little pretty bottom area down there.... Probably six acres. It was only aesthetically valuable, agriculturally it didn't cost anything. (Segment V, Agriculturalist, 2006)

We have deer, whitetails, muleys, an occasional moose, occasional bear.... Lots of eagles, lots of ospreys; ...the river holds all that here...it's kind of a nature preserve right there that keeps a lot of game close by...An unofficial nature preserve. (Segment V, Recreationalist, 2006)

It's the Best—2012 and 2018

It's peaceful, and it's tranquil, and there's no place you ever feel closer to God. You realize how much beauty he's put in this world. And that's... To me this is a little piece of paradise. (Segment IV, Agriculturalist, 2012)

But by and large, I would say living next to a river is a wonderful thing. You get a diversity of wildlife out there, it's a peaceful environment. (Segment III, Agriculturalist, 2012)

You cuss it out, and then you love it. (Segment II, Agriculturalist, 2018)

They graze down on the river bottom... it provides continuous water and usually the water is almost always open. We don't have to break a whole lot of it. We have sloughs running down there, which are from the river. Lots of protection and cover verses calving and wintering out in the hills with all the trees and the brush. The feed down there is unreal, like grasses waist high. Yes, it's just a nice, the location is nice for us, and we don't have to worry about drifting snow because it's just so protected. Just a nice, natural environment for cows down there. (Segment II, Agriculturalist, 2018)

I don't know about money-wise value of it, but you could run more cows down there than you can in the hills. The grass is better, the soil is better, um more moisture. Obviously, the trees and everything grows so much better down there that you can run more cows, so it's more valuable than the hill country—definitely. (Segment II, Agriculturalist, 2018)

The benefit... is that that the islands are created, they wash away regularly, they are very ephemeral, they come and go, and that siltation and that channel building and channel taking away is how the various species of wildlife evolved along the river and in the river, so the ecological systems really depend on that being a free-flowing river. It also makes it a good fishing river... It requires a free-flowing river to build these channels, yep. (Segment III, Recreationalist, 2018)

The Powerful Yellowstone

The Powerful River—2006

[The course of the river] is always...changing.... [It] could change drastically

from one year to the next. Every year, it's a change. (Segment I, Recreationalist, 2006)

I noticed that the river has probably come in 100 feet, and I've lost property down here. I have the river coming in, and it's sort of making another channel. It's taken quite a little property, the erosion. But I haven't got any qualms about that. I know living here that we're going to have to put up with some of that. (Segment I, Agriculturalist, 2006)

The Yellowstone River hasn't changed much since it formed. It isn't like the Missouri that can cut 400 to 500 yards out of a bank in a year. You don't see that here. (Segment I, Residentialist, 2006)

This Yellowstone is a mean, mean river during flood time. I live right on it. I know all about it. It's mean. It runs fast and it runs deep. (Segment III, Agriculturalist, 2006)

That river is a powerful force. It is a powerful, powerful thing. I don't care what man does, if [the river] decides it is going to go, it is going to go. (Segment IV, Agriculturalist, 2006)

That river can do hell. The culvert there could blow tomorrow, and then we'd really be in trouble. (Segment V, Agriculturalist, 2006)

The Powerful River—2012 and 2018

The Yellowstone River is... a meandering, ordinary body of water going through our community... In six years, the Yellowstone River has not changed its course going through Glendive. (Segment I, Civic Leader, 2012)

Very dynamic... up and down the river... the force of the river and the dynamics... Pretty hard to stop water. You can put a fire out, but pretty hard to put a flood out. It's very difficult. So yes, there has been dynamic changes in that river. (Segment III, Civic Leader, 2012)

It's just changing. I think it's pretty fascinating... it's just interesting... to see what that river does. We all know it's got that power. But it just changes, and if you don't cry about it, you know, the loss or anything and just look at it as being kind of amusing as long as nobody loses their life over it, I think it's kind of fascinating. (Segment IV, Agriculturalist, 2012)

I can't remember, it was in the thousands of years, that the river used to flow basically in this valley... And then the river finally moved over here, and it's been here... I've lived here for seventy years now. You say the river is changing patterns, minor adjustments here and there, but in seventy years it's been in the same pattern. I have a fishing spot again down on my brother-in-law's... I can tell you the river hasn't changed there in seventy years at all, and that's in a big curve. You'd think that it would really change, but no... [And] I did a little bit of research on it [our property] and again, thousands of years

ago or whatever the river flowed through here, and then it moved about two hundred yards that way. That's where it stayed for a long time. (Segment I, Residentialist, 2018)

A river is a live thing a sense, so uh, you know, it erodes from one side and gives to the other side. (Segment III, Recreationalist, 2018)

You know it always moves a little bit, but right here, I don't expect it to move a lot it right here. There's nothing forcing it to move. (Segment IV, Residentialist, 2018)

It hasn't hardly changed since we've been here for 14 years. It really hasn't. If the water gets high then it runs down on this channel right here, and then when the water goes down then that channel... there's no water running down it. (Segment IV, Residentialist, 2018)

I would say that the Yellowstone River is mighty. It always has been. It's kind of like fire; water is that way. It's got a lot of power.... (Segment IV, Civic Leader, 2018)
So, you know, the river is constantly changing. It's interesting, and it's fun. To me, it's fun to see the power of water and nature changing. (Segment IV, Recreationalist, 2018)

The river changes itself; it's got its own brain; it goes where it wants. (Segment IV, Residentialist, 2018)

I don't know that we can mitigate flooding, because it is going to happen. And when we get a year like this with all of that snow up there and all the runoff, my goodness, what are you going to do with it? You can't capture it. And we don't put in dams and things to hold it anymore. It wouldn't do any good anyway, there is too much water. (Segment IV, Civic Leader, 2018)

She's a beast. Just keeps moving back and forth, getting wider, more gravel and stuff. (Segment V, Agriculturalist, 2018)

The river changes every year... The bottom changes probably more than the edges, just gravel moves... but every year you have to re-learn the river fishing, because some banks, they just change, may be minuscule, may not... Yeah, it's a living river... We haven't killed it yet... Don't think we're gonna either. (Segment V, Recreationalist, 2018)

Major Flood Events as Lessons

Major Events—2006

I have places along the river where I see [erosion], but, to me, it is a characteristic of the river and I realize it's a natural thing. So...it's not a problem for me because I think it's a natural thing.... I see the river going up. I see the river coming down. I see the ice jams. I see all that stuff.... I've lived along here for a long time and you're not going to

do...[anything] to stop it. The more you do to stop it, the more it's going to erode. (Segment I, Agriculturalist, 2006)

The '97 flood took out the riprap and 500 yards of dike. I lost about seven or eight acres of irrigated ground. Ice jams are another one. It can go from a nice mild river and within about 30 minutes it will be running over the banks....When it flooded in '97 it deposited gravel over 18 acres of irrigated ground four feet thick of just gravel....We had to get the trees and debris off....[It took] two weeks....We used a tractor, a loader, a Cat, and a dozer. There were a lot of real sandy piles.... We had...to spread it out or push it into a hole. It was so fluffy it was hard to get around with it....I suppose that took a week or ten days. Then we went in with a disk and disked it and chisel plowed and took our own level and leveled the land. We spent a couple of weeks at that. We spent most of the summer getting it so we could plant it the next spring.... You don't realize all of the things that happen when you lose that much of a crop.... I suppose [it took] ten years to [pay off the expenses] Of course we lost seven to eight acres of ground that is totally gone. At today's prices, that is worth between \$15 and \$20 thousand. You still own it, and owe on it, and still pay taxes, but it is in the middle of the river. (Segment II, Residentialist, 2006)

The '97 flood forced us [in Laurel] to become more flexible....Our present day intake...is on the south side of the river and it was on the north side....And [now we] have that ability on both sides of the river....I don't know how many different times we tried to change the channel, and once the river has made its mind up, it...[doesn't] make any difference how much limestone you put in there, it's going to go where it wants to go....I believe it was right at...3.2 million to put that intake in there, so it was quite an investment. (Segment III, Civic Leader, 2006)

In '97 we had the highest flood on record.... [It] was a 500-year flood.... [The] REA was afraid it was going to...flood their new unit.... They riprapped it perfect [for] a half mile...and there has not been one piece go out of place. There's always a hole or something that may have been done better originally, but if you throw...riprap [in the hole] it just makes it better....To do it right, you want [there] to be about 16-foot width at the base, so you have a big strong base for the other to lock with, and then bring it up to about a three-foot width at the top....The weight crushes it down....You've got the dirt walls behind it that are packed and it doesn't seep very well. (Segment III, Agriculturalist, 2006)

After the '96 and '97 floods, there [were]...multiple projects.... The Corps approved some, didn't approve too many, but as the pressures build, we will have ourselves a canal instead of a river. There's a 404-permit process [and] sometimes it works, sometimes it doesn't. It depends on the Conservation District.... They can, depending on who [sits on] the Conservation District board, be very rigorous.... I think there ought to be some basic principles that have to be satisfied, and I think that those are conservation of the riparian zone, and conservation of the hydrologic character of the river. (Segment III, Civic Leader, 2006)

It is meander-land, and nobody can own that....There were river changes in that '98 flood, and, of course, some islands were created, and it washed down banks....Some people lost acres and acres of land....I know of one group who ended up with an island, and they claim it's theirs, because the river ran right through their property and created an island....Nobody pays taxes on it....For example, if this is a lake, and the water comes up in high water years to cover most of [the land], you wouldn't think that would reduce your taxes, [and] it doesn't. Or, if it goes down, and you can farm this for a while, you still don't pay taxes on it. But you can't claim it either... Its no-man's land.... [It] used to be that the Corps of Engineers could come in and just change things at will, and that caused its own set of problems, here and there. I don't like the idea of changing the direction of the river.... It has its own set of problems that come with it. It might help this guy who lost some acreage to reroute the water away, but it ultimately, someplace else, will cause a problem.... I think rivers should meander wherever they naturally go. (Segment IV, Civic Leader, 2006)

Well, it was about '96 or '97 when it flooded.... All of this was under water because it was up about 30 feet. We couldn't get into our buildings or anything over here; it was all under water. We had about four feet of water.... It damaged the trees in the meadow. It took three years to get it back in shape.... We have probably lost 30 acres in that flood, and it is still taking ground. (Segment IV, Agriculturalist, 2006)

The flood of 1996 took out Armstrong's Spring Creek. I was the one that said they couldn't do what they wanted to do. It was bad... Then it hit the press and they finally brought in experts. The landowner spent \$800,000 [on riprap] and it washed down the river in four days. I lost a lot of business because I stepped on the fishermen toes. They wanted it back at any cost. My family has been involved in stuff a long time and people hurt, because it was \$100 a day to fish the spring creeks. (Segment V, Recreationalist, 2006)

We did have a flood those two years, '96 and '97.... It did tear away a lot of my bank.... The topsoil that is gone.... It's done so much damage to our property out there in those two years of floods we haven't been able to get picked back up again.... We're not millionaires; we couldn't get it all done. (Segment V, Residentialist, 2006)

1996 and 1997 were historical record flood years and...conversations have really been stark because of those two major floods.... I think people got scared about protecting their properties and some properties were lost. And so, with the protection of property and living on the river, there's controversy. And I think, before the [floods, the] controversy probably wasn't as strong.... I think we can be good stewards to the water and the river ways but also [we can] protect our homes.... Somehow, we have to come up with a balance instead of just saying, 'Oh, you can't do this, and you can't do that.' Somehow, we have to work together to come up with what is the best thing for the river and [the people]. (Segment V, Residentialist, 2006)

The '96 and '97 [floods] were so refreshing, in many respects, because the river was just huge, and nobody had ever seen it like that. And it was rampaging all over the place and

doing wholesale channel changes down there in Livingston. (Segment V, Recreationalist, 2006)

Major Events—2012

In 1997 we had a high-water event that moved several hundred thousand cubic yards of sediment, forcing the river to go to a more southern channel. And in the subsequent years, '97 to '03, we put into the river various weirs and diversions, trying to keep water into our northern [municipal water supply] intake. And we were fairly successful, but it was quite evident that the river was not to be changed, and the fact that the Corps, Army Corps of Engineers, had made an edict that you will not put in a substance that will cause a diversion of the river in its natural boundary. So, we got together with the Corps... Department of Fish, Wildlife and Parks... EPA, and I think there was a conclusion by all parties present that the City of Laurel had one major option available, and that was to... put in a southern intake, which would allow us to capture water on the southern channel. (Segment III, Civic Leader, 2012)

In 1996 the river got extremely high... and it cut me off from about three or four hundred acres of property... plus the fact that it was damaging spring creek considerably... [which is important for] spawning ground and fish habitat. I tried to work with the Army Corps of Engineers, and the powers that be, and the EPA, and Fish Wildlife and Parks, and I wanted to shut the channel off. And they were very much opposed to doing that. They wanted to let the river run wild and free. And so eventually, the Army Corps did... assess the situation and see if there was not something we could do to... so [a consultant] put together a plan to move the river back into its original course... And I said, "That can't happen." And he said, "Well, why not?" And I said, "Because the regulatories [sic] will not allow it to happen. Will you?" And they all stood around and said, "Yes, it can happen" And I had to go through an environmental assessment of some sort, it took about 60 days in such a manner, and a public hearing... There was some fishermen that formed a Spring Creek Foundation, and they were very supportive of me and what I was trying to do, and morally, it was a local deal... so I put in root wads along the bank... and we closed up the channel... And we planted willows, and we planted grass, and I did a tremendous amount of work that cost pert near three-quarters of a million dollars... Then '97 came along, and we had another high event, and I lost the whole thing... It all blew out. It all blew out... I saw my stuff being destroyed, and it was so devastating... The root wads and the willow plantings and the sod deal, it just was not aggressive enough to take care of the running of the river through this area at all... So, I built a dike along the river and put in some heavy riprap. (Segment V, Agriculturalist, 2012)

That was '97 that I did that [put riprap in] ... during the flood. Because it came in a gush that year, and it was overflowing so bad. That was real low. And we brought in truck loads and a big crane, and the crane placed it where we were having trouble there... We didn't [get permits] at that time. But then after that we were told that nobody would be given a permit anytime anyway, so. (Segment V, Residentialist, 2012)

In '96 and '97, they went on a huge deal there, and they put in a big dike along the river there to protect the lower part of Livingston, the high school and the golf course and the grade school in there and the fairgrounds, then after that they paid a bunch of money and took it out, and then they had to put it back in. I think last year they put in a bunch of dike, and now they are taking it out again... It is an ongoing thing. (Segment V, Agriculturalist, 2012)

[During the '96 flood] the road broke in half... So once that went, it hit the island over there... and my next-door neighbor did not riprap. We were all riprapped... Well of course, the force, it hit there, came back, found here a weak spot and came right in my house... So, you know, it just breaks my heart... Then of course, the heavy equipment came down... they built a concrete wall clear across the front of the house. Then they brought in all of these rocks, all these big rocks... It is not as beautiful now as it was when we first came, because I have lost 100 feet of lawn in '96... Now of course, I have got a rock pile. (Segment V, Residentialist, 2012)

I think the real reaction we had against what happened in '96 and '97 was that when property owners saw big chunks of their land being washed away in the river, then they wanted to protect those properties so that they started building whatever kind of protective structures they could to keep the river out. (Segment V, Recreationalist, 2012)

Some participants also discussed how they were personally affected by the 2011 floods. One participant claimed this was the worst flooding event they have experienced since living here.

[The river] changed a lot during last year's floods. The high water moved a lot of stuff around, changed the flow of the river. The deep holes, some of them have been filled in with gravel and rocks because of the high water... There were some huge trees floating down, and it just moved a lot of debris around. It has changed... the flow in certain areas. The river has moved over... maybe 15 or 20 feet [in some places], maybe more... I think that [movement of the river] is the way it is supposed to be... that is what happens. (Segment IV, Civic Leader, 2012)

Each year we've been here, it's taken a certain amount of the bank. But that was the worst... last year by far, any one time, took away the most... it took anywhere from, last year I'd say anywhere from 40 to 100 feet of land, 12, 14 feet deep. And on the average, I would say it's probably 30, 40 feet straight through for three-quarters of a mile... Last year, it was just going out at the rate of three or four feet a day, sometimes more. Hard to stop it. (Segment IV, Agriculturalist, 2012)

Major Events—2018

The biggest change in the river is ice... That's what changes the course of the river. Because this house here next to us was down at the river... They had to move it... In '90-something. We had a really bad ice year, and well you couldn't see it but there used to be a little island there, and the main channel came around and just made a sweep and came by. Then it got jammed up and it came this way, and then it was coming in right into his

property... [And] our land, we used to be able to go down and there was a little island and a little stream that kids could play in that was shallow. And the island, it wasn't big, but we could put our boat there and everything, but it all got washed away... That hundred-year, I watched it disappear in two weeks. And I mean it had trees 6 inch in diameter on it. It was a big island... That kind of did away with our boating too. We lost interest. (Segment III, Residentialist, 2018)

Back in '97 when we had the tremendous flooding deal here that was before the wall we put in, the steel wall, and that river was cutting into the bank here. I have got 46, 47 now, truckloads of rocks behind the wall, big stuff, big rocks. So, we feel real secure with that, but it's a challenge at times. (Segment IV, Residentialist, 2018)

It wouldn't be, you know, cost-wise, even if the government would pay 80%... at our age it would never pay out. Because I really don't think you can stop the river through our section here... And according to what I saw from the guy that saved his RV park or something out of Livingston after the big flood in '98 or something like that... I think I remember hearing it cost him \$600,000... And according to that along here, you'd never... You'd have to have some valuable like a park or something. (Segment IV, Agriculturalist, 2018)

We're on the cutting bank... Took half [of the lost 150 yards of land] in '96 and half in '97... This year [2018] we lost a couple of feet. (Segment IV, Agriculturalist, 2018)

When we moved here, the '97 flood took out an island that was registered out here. This was a backwater, where the channel is now. The island was about a half mile long... and he said inside of two weeks it was gone completely. And there was 60-70 ft. cottonwoods on there. He said he'd come home from work and a portion would be gone, a portion would be gone, pretty soon, he had to go for a week or something and came back and there was nothing, it was gone completely. The channel had changed and come all the way over here and taken it all that off. The people used to drive out on the island and barbeque and have picnics and stuff, because there was a land bridge down here... [And the] '97 flood took that whole island out. (Segment IV, Residentialist, 2018)

Of course, we were worried about the Spring Creek [in 97], and at that time they hauled riprap up there for days... Subsequently that year, of course we built this wall that's notorious, if anybody has floated up there, they've floated by that wall that has all those granite rocks, huge layers of it. That's the protection. We were quite concerned this year again, but we got through another year. It's a huge issue. What's scary is the river is about ten feet below the spring, the main spring that feeds the spring creek and this irrigation. So, if it captured it, it would be bye-bye. You wouldn't see it again... And then you guys can interview me, and I would have riprap [laughs] ... Come back in ten years and it might be different. (Segment V, Agriculturalist, 2018)

It was lovely [living on the river] at first because I had 100 feet of lawn and trees. My side of the river was just a little trickle from the main one. Well, when we had the flood in '96, it cut the island in half... all that water came through, hit the island opposite, came

back, and... came right at my house... It just washed out the foundation is what it did, so the front of the house fell down. (Segment V, Residentialist, 2018)

There were comments referencing the 2011 flood in 2018, perhaps because it had not affected as many people as the 1996 and 1997 floods.

The city's got a problem in town here where the river park along there, it's eroding, the bank's been sloughing off. It started in 2011 when we had big flow and boy, the channel has really changed after that. And that's when the bank started sloughing off there. (Segment I, Residentialist, 2018)

Controlling Erosion

Erosion as a Constant—2006, 2012, and 2018

Here, the river changes a lot. It will move, in 20 years, from one side to the other. It will take up private land, and it will erode 600 to 800 feet of property per year. People on the other side of the river will acquire property. The river is dynamic. You can't control this river. (Segment I, Civic Leader, 2006)

Anybody that lives along the river has to have problems with bank erosion. Five years ago, there used to be one of the best cornfields in the whole area, upstream about five miles.... [Then the] river took one of its classic loops way off to the other side...[and] it went right through the middle of that cornfield. It took out 40 acres of that field and abandoned 120 acres where it had run before. And [now] if you look at that abandoned section, occasionally in high water [the river] will move through there, but there are young trees in there, and there's shrubs and bushes. (Segment II, Civic Leader, 2006)

The time that the river changed course drastically, and started moving into our property, it was just horrific.... There was a big island out there, and it was full of trees.... You would hear the trees.... It sounded just like bowling pins going down.... It literally lifted those trees every which way out into the river.... It was just unbelievable. [Then, the fallen trees were] knitted and packed with mud just like somebody had created it by hand, but it was just the force of nature.... [The fallen trees] diverted the water...which brought it into our place.... It just basically changed overnight. (Segment III, Agriculturalist, 2006)

When we first came... [the barn would] probably be just about 100 feet [from the bank] ...In a period of about a week or ten days it just kept working back.... Then, within less than a week, about 20 feet of the shed is hanging out in the river, the rest of it is all gone, washed out underneath... And then the one day I went out and... it broke off exactly, almost like you'd sawed it off. And the end was laying there in the water. The rest was gone, down to Glendive, I guess. (Segment IV, Agriculturalist, 2006)

I see a lot of change in the river structure, bottom, you know, from year to year, especially from high water. Sand bar that is there one year might be gone the next and so

on, so it changes a lot... To me it shows that it is pretty wild and it's dangerous, because a lot of places where the banks wash out there's big trees in the water and things like that until the next run off, and then the trees are gone, and it starts over again and spreads out. (Segment II, Recreationalist, 2012)

This five week-long pounding here was incredible. It was something to behold. It made me feel very, very small, very small in the big scheme of things. Two acres I lost... It was amazing... nothing really anymore surprises me, but that did. (Segment III, Residentialist, 2012)

The river changes a lot on us – we used to have an island around here in front, a small island. That's gone. Now big islands build up over there a little ways. And now this, it's starting to build another island over there. The river does some crazy things. (Segment I, Residentialist, 2018)

The river is its own, and it's no stranger, and it is no weakling. It is strong as all. It is amazing what that river can do. And we have seen the channels change every year, every year. (Segment IV, Residentialist, 2018)

In the years when exceptional high water... a couple of the channels at different times have actually switched places; one was going against the rims at one time, and then after a flood year then they had cut back... making another channel. So... just about every time you had high water there was a change of some sort there with the channels... We're kind of excited this year to see how far it's changed... the water is just starting to back out of there because it come clear up in our pasture. We've got some corrals and an old barn down there, and it came up to them. We're just waiting to let everything recede and then we'll go down to... see what's going on... But that's what happens, how it changes. (Segment IV, Agriculturalist, 2018)

It's just the nature of the beast, the river changes constantly. (Segment III, Recreationalist, 2018)

Erosion as a Problem—2006, 2012, and 2018

I understand that the Yellowstone River is the longest free flowing river in America, and I used to think that was a great deal until I lived on it. Now I don't. (Segment III, Agriculturalist, 2006)

Erosion of the river is probably the biggest problem we have with the river. (Segment I, Agriculturalist, 2006)

The first thing I've got to get across to them is they've got to stop the erosion on the river. The second thing...I've got to make them understand [is that] I'm not against the wildlife--I'm for the wildlife. Farmers try to keep the water clean... [by] not putting [in] pesticides and fertilizers, [and] we like to see the wildlife. I like birds and...everything,

but there does have to be a balance, and the farmer is feeding the people. (Segment I, Agriculturalist, 2006)

It [the river] cut a big hole in one of our fields, you know. Our ditch would come down and irrigate off to the side. Well, it cut through the ditch area, so those lands of hay are going to be dryland. You know, they won't be able to water again. So, it's done a sizable amount of damage. The bad part of it is it took some of our prime ground... You know, we lost a lot of production. (Segment II, Agriculturalist, 2012)

With so much rainfall, it flooded a lot of our timber pastures, took the fences out, and took a dike out above us and it washed through our place... So we had trouble, we couldn't use any of our pasture until probably October. We had to come back, put the fences in, remove the trees, a lot of holes in our pasture. So, we had to take everything [livestock] to the hills... and then in September all grass was out because we took the cattle and put them down here, so then we had to hurry up and fix the fences and get the trees off, and then move everything back here. So, it was really a trying year. (Segment II, Agriculturalist, 2012)

I'm not saying that the Yellowstone is a bad thing, but it can do a lot of damage to agriculture. Not just me, I mean you take from one Yellowstone Park clear to the end, you know, it can tear a lot of things up... We've probably lost, give or take since I've been here... probably lost 60 acres of our south boundary... The high water. At our turnoff, I could just see the Yellowstone River when I moved here. Now it's right by it. (Segment IV, Agriculturalist, 2018)

I remember when we talked before, the trailer house hanging conversation we had, it went down the river... kept cutting, it went down, couldn't get it out, cut it again the next year and it was gone. And it's still cutting that field out more and more every year. The guy who used to own that little chunk of land just about doesn't have that land anymore, it's gone. Railroad right-of-way is on one side of it, and his neighbor, he was like in the triangle, and that whole triangle is just about gone. And it'll keep going, and eventually it will cut like this field out here did. (Segment II, Recreationalist, 2018)

To me, being along the river is a detriment, not an asset. It's just a big pain in the ass to me. But he [my brother] doesn't want to sell and I do. So, I always tell him, well, your part of the farm was right there, it went down the river. So, there's your part [laughs]. (Segment II, Agriculturalist, 2018)

[We hope] to keep [the farm] going down the family. But if that river don't quit, we're going to have to sell it or something. I don't know what our pump site looks like now, that one up there. We branded here a couple weeks ago, and some guys were up there out on the main road and come into it, and they showed me a picture of it, and he are my two pumps with water running around them. So, I don't know what... I hate to go up there and look at it. But I'll get to deal with it and we'll do something. We don't quit. (Segment II, Agriculturalists, 2018)

It's [the river is] not an asset... because of the destruction that it does... We've had... since 2006 there's been quite a bit of land go away since you were last here... So, I would say it's not an asset when it takes your land away... Because again, there's no monetary return from having the river there... but it's what we got, so. (Segment IV, Agriculturalist, 2018)

We had a couple features downriver from here that have gone away because they flood out. Some of these waves will flood out. It will push that rock out of the way and then our great big wave that we have been surfing for years is gone... It is kind of temporary. And we had a really super, super awesome wave on the Stillwater that went away, they called it Mr. Bubble. And it was just an incredible place to go play, I mean just ridiculously fun. And it got flooded out, and... that went away. (Segment IV, Recreationalist, 2018)

The Meandering River—2006, 2012, and 2018

I never know where my property line is at.... The river takes a little every year. In real high-water years, it's more aggressive. It takes fertile soil real fast.... I'm not whining, I'm resigned.... I've resigned myself to this in sadness. (Segment IV, Agriculturalist, 2006)

I wouldn't say it is any abnormal erosion.... It is the natural way. It needs to change and move where it wants to move like it does. (Segment III, Residentialist, 2006)

I don't think that floods should be controlled. And the reason is [because] it cleanses the river. It provides sanctuary for the birds; it is a natural process. It is almost like a flush. It cleans off the gravel. It helps the spawning [and] provides a nesting habitat for particularly the geese on these big islands because the debris and junk will come down there, so it will protect them. (Segment II, Recreationalist, 2006)

I think erosion is a natural thing, and that we should live with Mother Nature. I mean, the river's supposed to meander, so we'll have to live with it. (Segment II, Residentialist, 2006)

Sometimes it's heartbreaking to see [erosion].... But, on the other hand, it's a wild river and it's expressing itself in such a way that it makes it what it is. It's a living entity that gobbles up one bank one year and might turn around and gobble up the other bank the next year. That's what's uncontrollable and that's what makes it wild and adventurous for those of us who like to get on that sort of thing. (Segment III, Recreationalist, 2006)

I noticed that the river has probably come in 100 feet, and I've lost property down here. I have the river coming in, and it's sort of making another channel. It's taken quite a little property, the erosion. But I haven't got any qualms about that. I know living here that we're going to have to put up with some of that. (Segment I, Agriculturalist, 2006)

What do I do about the erosion? Stand back away from the bank. (Segment II, Agriculturalist, 2006)

Without any dams on the river, it goes through a normal cycle like a river ought to, but the channel changes a lot because of that, a lot of new gravel bars come and go, and the river channel moves and changes. I put a boat ramp in here and five years later it's sitting on a gravel bar. So, you can't blame anyone for that, it's just the way it is. (Segment II, Recreationalist, 2006)

I don't know if you'd call it a problem or not. That river is very active; it moves a lot so it's always cutting banks and moving things around a lot. The ranching part, the farming part of me looks at that as, 'OK, what's it going to take next?' I don't particularly worry about it. I don't see it as a problem.... It does what it does.... I look at a cut bank here, and [know it] deposits something down there. It gives and takes. (Segment II, Recreationalist, 2006)

That is [the river's] own renewal. Yeah, it does eat away at the bank, but that's the nature of that. Again, nature is the operative word; it's natural. I guess I don't see a benefit to try to control something that is that big and powerful. (Segment II, Recreationalist, 2006)

There was a time when a property owner was at a loss but to just accept the influence of the river and they just accepted it.... I guess there is a certain communion with owning the land and understanding how it works and knowing you take the good with the bad. The river changed course and I lost that bottomland but at some point, I will regain it. It might not be my generation; it might be through my kids. (Segment V, Recreationalist, 2006)

We've seen really dramatic changes [in the river channel] This is a river that migrates from bank to bank... as a fishing guide... sometimes your favorite spots go away and sometimes they change, but... that's kind of fun to see a new river. (Segment V, Recreationalist, 2012)

This is of course, as you know, this is the only undammed river in Montana. So, it is nature. The river is changing all of the time. There is nothing we can do about that. (Segment I, Recreationalist, 2012)

I mean it is all just a natural occurrence on a river that is not dammed. It's just the way it is [laughs]. (Segment IV, Civic Leader, 2012)

It [flooding] has kind of purging effect on the countryside, you know. While there can be obviously tragic effects of those kinds of things... looking at it in big picture, you know, over generations and decades and hundreds of years, it's just kind of part of what happens, you know, cyclical. And that's kind of part, again we've got a free-flowing river, you know, it does that. (Segment IV, Recreationalist, 2012)

Building along the banks too close to these rivers is really a mistake. Certainly, a free-flowing river like this, it cuts a wider swath than anyone would think. And so, you need to allow that to happen. (Segment V, Recreationalist, 2012)

I guess I accept the Yellowstone. I just accept it and expect it. And it's just been here all my life, and I guess it'll be here all the rest of my life too. (Segment II, Agriculturalist, 2018)

Growing up out at Kinsey was an awesome opportunity, and we had farm ground right along the Yellowstone River. We got to see the beauty of the river and basically what it can actually do as far as soil erosion, too. We had a field that we'd lose a little chunk of it every year when the water come up. But as far as the Yellowstone River goes, we take it for granted until we get to see other places... then you understand it, and you realized it's an awesome thing to be living along the river, especially the Yellowstone River. (Segment II, Civic Leader, 2018)

Several years ago, it flipped. It cut out a small channel. It used to come along the cliff and aim at the west side... but then it blew out a channel, and it now it aims on the east side. And the river is almost all over there now. It's fascinating. The river does what it wants to do. It's an interesting... it's a living river. (Segment V, Recreationalist, 2018)

This river is a little bit more volatile, it's ever-changing... the Yellowstone River has its own mind so to speak, you never know when it's going to change. Which, causes, well you better be on the spot. (Segment I, Civic Leader, 2018)

I've lived along the river all my life, and I know when that river goes, it's going to go where it wants to go. (Segment I, Civic Leader, 2018)

It was interesting, again as we've gotten older and taken a look at things, the original map of what's there and what the map is now, and we've lost land, but we've also gained some acreage. So that's been interesting, and we've gotten in on what is ownership of what land. And my grandfather would be amazed of the waxing and waning of the land on the river, I think. (Segment II, Recreationalist, 2018)

Of course, living by the river, you really couldn't ask for a better place to live. But it does present its own challenges, especially when you are doing farming... I love it... [but] we lose bank every year... it kind of depends on the year. In some spots we've probably lost a good 20 feet, you know. We're in a spot where the river kind of bends, and its hitting that south bank with a lot of force in the spring, and so we always lose some there. But... what we lose we kind of make up for, too... as we lose ground to the west, it's been sedimenting into the north and the east... So, you know, we lose ground, and we pick up ground, I guess. (Segment III, Agriculturalist, 2018)

It's lost over thirty feet wide by almost the entire width of the property here... I think along the river it's 500 or 600 feet... That is all gone, it's all out. It's nonexistent here anymore. I still have a bridle path but it's underwater [laughs]... You just have to accept it. You can't sit there and whine and carry on because it took the bank away. (Segment IV, Residentialist, 2018)

And I know it has changed course a lot, an awful lot... I used to work on a ranch... and I watched the riverbank erode. It was probably 25 acres of hay ground. It was awful

good—right on the edge. Good soil, and good growth, and everything. And every time the high water would come, it would take another 5-10 feet, and now that's just a sliver. But it's been kind of fun to watch some of the change. But you're not going to change it. Man isn't. Nature is going to make the changes. (Segment V, Civic Leader, 2018)

Section 3. Bank Stabilization: Should We, or Shouldn't We?

Stabilize to Protect Landowners?

Across all field seasons, there was no consensus regarding which bank stabilization technique—riprap, bendway weirs, jetties, barbs, bank sloping, and others—is most effective or appropriate. Many landowners near the river expressed desires for better “rights” when deciding how to manage their properties. People in favor of bank stabilization projects explain that they place a high value on the assets such as farmland, infrastructure, houses, and recreation. They further explain that they hope to “protect” these assets, and they question whether the people against bank stabilization understand the consequences.

Others describe stabilization as simply causing more problems, and they believe it is best to let the river flow naturally. These folks sometimes explain that those who do not appreciate the free-flowing river should not have property along it. They argue that living near the river is best, when we allow the river room to “rampage.” Some participants described projects that they questioned were legal based on current permitting requirements. These projects included using construction debris, mostly discarded broken concrete slabs. Many explained that car bodies work exceptionally well for stabilization, and some did not see a problem with their use. In 2006, some participants were against bank stabilization simply for aesthetic reasons. They indicated they preferred “subtle” solutions. Similarly in 2018, some of those opposed to stabilization explained if stabilization projects looked more “naturally appealing,” they would object less to stabilization practices.

Nuances in the conversations regarding bank stabilization were found in each field season, meaning that more than a few of the participants suggested they could see tensions between desires to protect properties and the need to protect public interests. They were quick to indicate that there was not a simple answer when considering how to balance those competing needs.

Protecting Private Property—2006

I think we like to be left alone.... Don't come in and try to take it away from us. I have heard some stories from up at Billings where they come in and actually run farmers off the riverbank.... The regulations said he could not be on the riverbank even though it was his private land. He could not dump his rocks down there because he was messing up the river. (Segment I, Civic Leader, 2006)

I just feel like landowners should have the ability to stabilize banks, you know. You're farming along the river and it doesn't do any good to have that water on your fields. And I don't really think it does the river any good either. (Segment II, Agriculturalist, 2006)

Allow the landowners to protect their property.... [Allow them to] do whatever they can afford to do. I wouldn't say, 'Go get 35 or 40 car bodies, run a cable through them, and anchor it to the bank.' I don't like that. I've seen it done. It's not effective. (Segment II, Civic Leader, 2006)

But it's like they're taxing people that live along the river...because they happen to make their living there.... I'm not saying...there doesn't have to be some regulation, because there will always be that case where somebody's being 100 percent neglectful and harmful to it. But, for somebody to just do something like put a barb in to preserve what he has.... I don't think you ought to begrudge that or make that system as tough as it is. (Segment II, Recreationalist, 2006)

Some comment on new development being the source of over stabilization and claim that these new-commers should have to live with the consequences of building so close to the river. Encroachment of people into the river valleys, you know.... That's where I think, maybe, you're getting more of the demand for people to stabilize those riverbanks because, of course, you've just bought your 100 acres or 50 acres and the river runs through it and you don't want to see it washed down to Billings. (Segment II, Recreationalist, 2006)

I really think that the authorities should be more flexible in allowing landowners to protect their property. It's such a hassle to go through all the steps it takes to put riprap on your property.... There has been hundreds and hundreds of acres lost here.... I feel for the larger landowners that have a lot of river frontage that lose a lot of property every year and really can't do too much about it. (Segment III, Residentialist, 2006)

Farmers and ranchers protect their soil. It takes too long to regenerate an inch of soil to have it wash down the river. In this part of the country, 100 years will build an inch, and, depending on where it's at, it may take 500 years. (Segment III, Agriculturalist, 2006)

Bank erosion is concern to the agriculture producer because it's taking away land. And then the free-flowing river advocates say the agricultural land should be a buffer...so the river can go where it wants to. But...different parts of the river have different erosion factors.... The erosion is not really a big issue until you get below Pine Creek Bridge. Where the river tends to be flatter and it tends to erode, and if I had land on the river, I'd be very concerned about it and I'd want to protect my property... [People use] riprap or the hard facing...Soft facing is where you lay the cottonwood logs down and bury the cottonwoods, so the roots face out upstream. That typically doesn't work here in a major flood. (Segment V, Civic Leader, 2006)

So, what's our puny little efforts to control the river and keep it from your house? Your house should not be built in those floodplains, or if you're going to build it there, you have to be willing to let it go. And letting it go has some consequences too because you're putting all that stuff in the river if your house goes downstream, besides being expensive and stupid. (Segment V, Recreationalist, 2006)

As far as a residential house, if the guy wants to build it there, ok, it's his land. Build it. But I don't think he should be allowed to say, 'I'm going to armor the riverbank'.... [And], like I said, nobody does that around here, because it floods. But I know that further up the river that's done all the time. And [on the] lower river too. You go down

below Bismarck, North Dakota [and] there are a lot of big homes built right on the river. And they're all rock and everything.... It's beautiful. But let's say something happens, and it washes...[those] people away. Then, to me, too bad. I mean, that's the way we should look at it. (Segment I, Civic Leader, 2006)

Protecting Private Property—2012 and 2018

We were talking about that...I said, "I just don't know what a guy would really do." He said, "I do. You move out in the dryland hills." [All laugh] "You get away from the river. While you live on the river, you gotta fight it." (Segment IV, Agriculturalist, 2012)

I think it was more the Corps of Engineers fighting them about the riprap... just a little bit north of Savage. They were dumping rock, regular rock rock, off the bank, and the Corps come along and said they can't do it. And the guy said, "Hey, it's my property." And we said, "Yeah, but the Corps has got control of the river. That's the problem, or situation." (Segment I, Civic Leader, 2018)

I mean there's a lot of good that can come from work along the river... I know a lot of people think that it should be able to meander anywhere it wants to go, but when you're the guy that owns the ground and is trying to raise a family there, etc. I think people just really need to look at landowner rights as well, because as a landowner we really need to protect those rights. (Segment III, Residentialist, 2018)

I'm not trying to hurt anybody. All I'm trying to do is hang onto my land and save my crop... What gives people the right to come along and say you can't do that when it's not costing them a penny? ... My grandfather would never spend any money on the riverbank. He didn't, he says, "Oh, it'll be fine... It takes, and it gives back... Right now, it's taking." Well, we lost forty acres down there in the trees... And when high water went down... I told my dad, I said, "We've got two choices... We can either stop this now... Or we might as well put a for sale sign on this place... It's going to come right through... It's going to cut off thirty, forty acres." ... So, we just made up our minds we were going to stop it. And we stopped it. And it hasn't moved since... And, um, I think we did a marvelous thing, but I'm sure there's somebody, somewhere... I call them the tree-huggers [that say] the river should be allowed to meander wherever it wants to go. And I'm like, that's fine if you don't own the land along the river, and it's not your livelihood. (Segment III, Agriculturalist, 2018)

Hindsight is real good foresight.... If I [had known] it was going to be that much of a deal, I guess I wouldn't have went there in the first place. But once you're there, you do what you have to do, so... I would say one thing: do not build your house right by the river. And if you put in a basement, put it basically above ground because it will get water in it... That would deter them [future generations], I think... the trouble with the river is it's got a mind of its own, and it can change so much... And flood insurance, it may be very expensive if they're close to the river... be prepared. (Segment III, Agriculturalist, 2018)

It can be bad, but that's nature, that's kind of the course of things. It gives and it takes away... I think landowners should have that right to... protect themselves... you've got extremists that want everything to be wild and everything, to leave it how it was before man got here, but man's here and we're not going away, and you know, as far as the whole ecosystem, we are part of that ecosystem now.... There's got to be a balancing act.... People, I think, should be able to protect their property, but at the same time you can't turn the river into a big ditch. (Segment IV, Recreationalist, 2018)

And a lot of people want to think of natural boundaries. Well, they don't own property, and it would take our pivots out and everything. So, there's kind of a fine line there.... I mean, I'm not against the Yellowstone River... don't get me wrong... But right now, the saying is, "What the Yellowstone takes, the state gets." So, if it takes his and forms an island, that's a state property as I understand it. (Segment IV, Agriculturalist, 2018)

If [erosion] is affecting a person's livelihood, if it's affecting a person's home, um, I believe they should have the right to protect that. Um, but... I have mixed feeling I guess you would say about it. Because I also believe that it should be left alone. But then again if you try to change it, it's going to. (Segment I, Civic Leader, 2018)

For and Against Stabilization

Pro Stabilization—2006

I would like to see us get to the point where we could work better with all the players.... You have your environmentalists that say, 'Don't you touch that river. That is a wild, free flowing river.' But, at some point in time, the people that live along-side the river should have a little bit better say about what happens....If they would allow us to define the course [of the river] better, to do a little bit of work up there, maybe do some more riprap,....it seems to me...it would be really helpful....At some point in time, I think, the people's needs should have a little bit more importance than the ducks. Hell, the ducks will land in the river, wherever. (Segment I, Civic Leader, 2006)

I'm no longer in favor of the free-flowing river. You can have a free-flowing river, but you've got to protect some of the assets. One of the assets is this irrigation ditch that waters a lot of farmland in Yellowstone County.... I think we've swung too far on the pendulum [toward] the free-flowing river. You can still have a free-flowing river but protect some of the assets that have been there, like this irrigation ditch [that has been here] since 1890. (Segment III, Agriculturalist, 2006)

Riprap in key locations in the river is really important for landowners. If they're not able to riprap, they're going to lose land. (Segment III, Residentialist, 2006)

Free flowing at whose cost? The people who want the river to run where it wants to run don't pay for it.... I should be getting an award from the free-flowing folks because I've contributed a half-million in the form of lost land. (Segment IV, Agriculturalist, 2006)

When we're talking about the Yellowstone, we're not talking your normal Montana river. I mean...there's a lot of power in this bad boy.... It will do what it wants. So...to keep it from eating stuff up, you've got to get pretty tough with it. (Segment IV, Residentialist, 2006)

We've got a bunch of riprap that we got put in before all of the environmental regulations.... I don't know...if we can even riprap now or not. It's a touchy situation....A lot of these...environmentalist seem to have a problem with it....They said it can create sediment problems....I think it all boils down to they think that if the stream wants to move, it should be able to,...even [if] some guy's paying the taxes on the land....If the river wants to take it all out, they don't care. I think that's the way they look at it. (Segment IV, Residentialist, 2006)

People that work in those types of positions in government are so far removed from the reality. They think that if you drive a bulldozer in that river, and you change something it completely upsets the ecosystem. That is bull. You can't begin to hurt it because it changes itself. In a day that river can move more gravel from one side to the other than you could in a lifetime with ten bulldozers.... Experience, and working around the river, and doing that sort of thing—I don't have a degree—but it is just common sense. I have watched that river for years, and I have seen what it can do, and what it does do.... I don't see how you can really hurt anything in that river with those machines. You don't want to bulldoze it out like a bowl, all the way down....but I know dang good and well the fish are going to be swimming, and you aren't going to kill them. They will tell you it is harmful. I don't believe that.... The fish are fine. (Segment IV, Residentialist, 2006)

Pro Stabilization—2018

I think the riprap is great. Otherwise, I guess we could just turn the whole state from hills to hills back to the state and forget about it because you might as well not have land there then. I mean you might as well not have private enterprise on it at all. Billings should go away if you're not going to riprap in some shape or form. Don't you think? ... Our railroad should go away, you know [hypothetically] (Segment II, Agriculturalist, 2018)

I'd like to see them leave some of the control of the riverbanks, be a little bit easier in some ways, but maybe that's from an agriculture standpoint that would make it cheaper to do something... Probably some of our riprap has caused trouble over the years. I guess I don't see... to me, the riprap has been good for the river where they let us put it in... And there's been several farmers I've watched just from the highway that just lost whole fields from the river because they've... put so much emphasis on the ability to riprap, they won't let them do it... I don't know whatever transpired, but I just know that he had that trouble on the high water the same year that the train fell in the river down here between here and Forsyth... And they went right to business putting riprap in the river. That was... it kind of makes you wonder about it, you know? Why are we holding up on agriculture land? (Segment II, Agriculturalist, 2018)

It's a necessary thing, yeah... and they did do some here this year or last year to protect the road over here... to kind of push the river back this way, and I think they did a good thing... It definitely is a necessity. (Segment IV, Agriculturalist, 2018)

It requires riprap... It's the only option I have. (Segment V, Agriculturalist, 2018)

There's a lot of opposition to riprap. And they say it changes the flow downstream, but if you let the bank erode, it also makes changes downstream because the gravel and sand that comes out has to go somewhere. (Segment V, Residentialist, 2018)

If they were ranch owners themselves, I think they would be a lot more heartsick about it. It's recreational land to them. They lease the land, and they're great stewards in that they want it grazed correctly and all that kind of thing, but on the other side of the river is a ranching family and they just religiously are up-keeping those banks all the time.

Whether you feel that's right or not, they do practice a lot of bank stabilization. (Segment V, Agriculturalist, 2018)

Opposed to Stabilization—2006

I prefer it not to be stabilized because I think we need that floodplain to be utilized by the river. It's there for a purpose; even though floods impact a lot of people, it has a lot of benefits too. It recharges the soil. It spreads out water so that floods aren't as severe downstream. So, the more we stabilize our banks, the more we armor them, the more intense the flooding will be downstream. So, that needs to be managed. There must be a master plan for managing bank stabilization. (Segment II, Recreationalist, 2006)

I don't see that the erosion itself is a huge problem, unless you are a farmer that is losing ground, which is big. I don't think there is much fighting [erosion]. I think riprap is a mistake. I think riprap is almost an arrogant way that man tries to control a force much bigger than himself. (Segment IV, Recreationalist, 2006)

Everything along the river has been affected by erosion because it's either cutting or adding to, you know. Well, see, it's always trying to slow itself down... I think, as we make it straighter, we're going to create another problem, where it's just going to keep going down, down, down, and it'll keep getting deeper. Then it will fill up Lake Sacagawea with all the silt. That's what I think will happen if we all got our way and we ended up lining our banks with concrete, we'd end up having to dredge the river. (Segment I, Agriculturalist, 2006)

I've seen where riprap has been put in, and the river just takes it down after a while. Then you're altering things. I guess, personally, I think it should be left alone because it's still a natural river. (Segment I, Recreationalist, 2006)

The river is going to take its course. I don't think man is smart enough or huge enough to change it. They have poured millions of dollars into riprap on the Missouri, and it has failed. I hope they never do it in the Yellowstone.... Let Mother Nature do its thing, and

it will be fine. It always has been. Don't try to change it. (Segment I, Residentialist, 2006)

Landowners put riprap or whatever.... You just cause the problem to shift somewhere else. I think if you are fortunate to own land on the Yellowstone that you ought to take what it gives you. (Segment II, Recreationalist, 2006)

This is a coldhearted thing. You bought...[land] next to the river, and stuff happens.... It is kind of cold, but, dependent on how they were looking when they bought it, [they were as likely to] gain some acres as they were to lose some. The idea of putting in riprap or doing a lot of monkeying around in the river, I don't think it's a good idea. You can save that small piece of acreage, but when you start pushing that current around somebody else is going to be affected by that, and you don't know who downstream is going to lose their piece of heaven that they bought. (Segment II, Recreationalist, 2006)

If the guy across the river has enough money to put in all kinds of riprap...and the next guy is just struggling to survive, all the erosion goes over to him. That's not right. Let the river be the river. Nobody's forcing anybody to live here.... I think that's something people should consider when they're buying a place. Look at the way the meander is going. (Segment II, Residentialist, 2006)

The riparian zone along the river is altered as soon as you channelize the river. You don't have the over-bank flows...that renew the riparian zone along the river. And that's habitat for wildlife of all kinds.... If left natural it can actually help alleviate flooding problems downstream. So, a lot of the times, the channelization of the stream just creates more problems.... [And] there's a loss of values in terms of recreationists being able to enjoy...a viable fishery. (Segment III, Recreationalist, 2006)

The non-control of sprawl along the river system, in flood zones, [is a problem]. [The river] needs to be protected in my opinion. Number one, it's a wildlife corridor, and number two, it allows the river to act as a living organism. In a sense, it is—it might migrate a little bit. Now, if you're a guy who owns a farm and you see 30 acres of your property move into the river, and your property line...is now across the other side on a sandbar, that irritates you a lot. So, you want to do something about it. But what you're doing is screwing the river downstream for somebody else. To me, that's a problem. (Segment III, Civic Leader, 2006)

Channelization is a problem because the river loses its ability to cleanse itself, it increases flooding, it does a lot of things in the long run that could be disadvantageous to a system like this....A river that no longer has any of its own storm controls—oxbows and a nice riparian zone—doesn't attenuate extremes....Riprap destroys the river environment, and, from an outdoorsman perspective, it's awful....It channelizes the river, it moves the flood...events down the river. I think there are points on the river where you have to [protect the banks] because of our historical practice of locating facilities that are almost impossible to move. If I had my druthers, would I druther those refineries were away from the river? Yeah. But we can't move them today. (Segment III, Civic Leader, 2006)

[As] a hydrologist, I studied river mechanics and fluvial geomorphology and from that perspective, the channelization really changes the character of the river. [Channelization] creates...an artificial river system, really. Often times the so-called channel protection work that's done in one place, causes impacts immediately down the stream. The river is not allowed to meander and shift as a mature river like the Yellowstone wants to do. It can cause unnatural artificial areas of degradation and aggradation, or deposition, or erosion of stream materials, or loss of streamside vegetation. We're losing the cottonwood trees and much of the riverine environment is changing as a result of man's uses and developments. (Segment III, Recreationalist, 2006)

Keeping the river from meandering is like stopping a natural process. The river meanders. Rivers do that. Particularly mature rivers, like the Yellowstone, that are not constrained by the geology. In other words, it's not a rock canyon, it's a meandering river. Keeping it like it is means allowing it to perform its natural function. It doesn't mean locking it in, channelizing it, holding it in the same channel forever and ever. That won't work. It simply won't work. (Segment III, Recreationalist, 2006)

I'm not sold on whether we should try to engineer the river with riprap.... I think that's very unnatural. And, yes, [the river] will eat your property. It was eating into our land.... but we never riprapped it. It's a natural thing. And I guess that's another thing: you got to let these streams be natural. I think you got to let them have their natural habitat, if you will. It's like an animal; a stream has a habitat, doesn't it? (Segment III, Agriculturalist, 2006)

Riprap is what I am afraid of.... It is just taking away the wetlands, side edges, the rearing ponds, the place where a lot of things happen in the ecosystem. And the riprap is like building a ditch. You don't have...the little wet spots, the things for the little fish to hide in and rest.... The otters, and everything else, comes in through there. When you riprap like that, you increase the force of the river coming down, and it will move stuff and it will keep moving. It will force the guy down below to riprap if it changes the course the little bit.... [Now] he's got to riprap, too, so we are losing all these side wetlands that is really important to the ecosystem. (Segment IV, Recreationalist, 2006)

It's not great for riparian areas when you have a riprap bank. That wrecks it. (Segment V Recreationalist, 2006)

Our attitude is that we'd be more than willing to move the fence ten feet than screw with the river. (Segment V, Agriculturalist, 2006)

I noticed...up by Miles City, the river was coming in really tough, onto their [railroad] tracks. And they did a lot of work there, and they've got that all lined up. To me, it looks good. I mean, I don't have a problem with that—it's pleasant to look at. It isn't big, old, massive iron and rock sticking out. It's just nice. It's like a blanket of nice rock. They used a good granite rock...[that] is reddish looking, it blends in with the landscape. That's another thing.... If you're going to do anything, make it pleasant to the eye... because most people, [when] they can look at something camouflaged in there, they

won't say a word. But, as soon as you got a big, red, thing sticking out, they'll say, 'What is that? Why is that there?' Same way with irrigation pumps, you know there...[are] pumps up and down this river, and nobody will mess with them. But [as] soon as somebody's muffler gets loud, they'd say, 'Oh, what is that.' (Segment I, Civic Leader, 2006)

I don't know if there should be some riprap that should go in there.... You don't want it to look ugly from the river.... It's just an eyesore, it just looks bad. (Segment I, Agriculturalist, 2006)

Higher up the river, I see more of the weirs...a little more subtle stuff. But there is a tendency to dump rock in the river... [and my objection] depends on what it is. If it's natural stone—not really. If it's concrete, it doesn't look nice, and [the] goofballs who leave the rebar sticking out of it aren't too nice. (Segment II, Recreationalist, 2006)

The riprap is unsightly, and [when] they dump rebar...it is dangerous for the animals. (Segment III, Agriculturalist, 2006)

Riprap [is used for erosion], but that's not pleasing as it is so unnatural looking. (Segment III, Recreationalist, 2006)

I like [big rocks] better than using old concrete, and stuff like that. Keep it as natural looking as you can. And you know, barbs and everything, they end up not looking natural. If you can do some landscaping, in turn with the riprap, you can have a pretty, nice-looking bank.... [Use] willows and trees to create a stable bank rather than creating an armored bank.... The river's a moving, living thing, so you're always going to have an instability...someplace. (Segment IV, Recreationalist, 2006)

Opposed to Stabilization—2018

We should respect the natural force of the river... The river itself is like a wild animal, you can't control it; it's been tried since the white man moved here by... the shoring of the riverside with junk cars and rocks and trees and old tires. And the river usually just does what it wants to do... (Segment III, Civic Leader, 2018)

We've sat through some very contentious meetings with landowners... Certainly there's a hardship. You're talking to people that don't have a lot of financial resource to stabilize their land, and I guess, not to sound heartless, but at the same time there's a different level of responsibility by owning property with a resource like a waterway.... So, it's very difficult conversation, I think. And I feel for these people... I understand those issues and what they're up against, but at the same time you live on the river, and that's kind of the thing, you know. So that's kind of my feeling anyway. (Segment III, Residentialist, 2018)

These prairie rivers were meant to, well "meant to" is a strong word I guess, but they expand, and they retract from their riverbeds, and that shapes everything around them. So that dynamic of natural change is part of what I would consider the integrity of the

landscape. The landscape staying true to what it is. And we don't want to do anything to block that, because at the end of the day I don't want to say I'm totally self-interested, but there is a lot of self interest in this, it's just like that keeps the ground healthier, that keeps the animals healthier, that keeps me happier and doing less work. But also, maintaining the wildlife populations is super important to us too. And, allowing the river to behave how it's behaved for thousands of years, I think helps with all the wildlife that have evolved to depend on that river for the same amount of time. So, you know allowing things to happen as much as they can like before we were here, I think, and I hope is better for the ecosystem as a whole. (Segment III, Agriculturalist, 2018)

You can't divert your rivers, you can't dam them, you can't create problems with the flow. Every time you try to straighten a river out, you create more problems. (Segment IV, Residentialist, 2018)

I mean this is a wild river, and you can't stop it. You'd have to put pilings down to stop it. I wouldn't want to see that anyway on this river... I even hate to see the riprap, really, because that alters the bank. (Segment IV, Residentialist, 2018)

It's a wonderful river. And I just... I was always afraid that somebody would mess with to the point where we would ruin it. And it's such a healthy stream, just kind of left alone. (Segment IV, Civic Leader, 2018)

I have got actually a little bit of a soap box... one of my pet peeves I guess... the use of concrete on the riverbank. And I was really outspoken... about how horrible I think that is, aesthetically... My point with that is that we have local rock; we don't have to truck it in or train in in from thousands or hundreds of miles away. Its right here; it's actually on the river. We can mine it and we can use it and really make it much more naturally appealing than having these big chunks of concrete laying all over the river... we should be utilizing this resource, this rock in this case, that is natural, that satisfies Corps requirements. That should be a requirement... [And] I think that as we become more sophisticated as landscape architects and as stewards, that the bio-riprap or the ways that we could do more sensitive armoring of the river... They're starting to take hold. I think that the patience level of we, as a society, is probably not quite there to sustain it at this point, but we try to promote that, and we'd like to see more of that, and try to use more vegetative solutions versus the rock solutions... (Segment III, Residentialist, 2018)

Nuances Concerning Bank Stabilization and Other Controls

Nuanced Opinions of River Controls—2006

People would say that in order to be environmentally sound I need to let that river come rip-roaring through my property and it will be fine in 500 years. I don't have 500 years. There is benefit to man being here. We do good things here. Man does need to manage, but he needs to manage softly. (Segment V, Agriculturalist, 2006)

You need to riprap the corners of the river but leave the straight-aways alone. The river can meander, and it has.... It has probably been all over this valley. (Segment II, Agriculturalist, 2006)

Riprapping is highly controversial because agriculture is such a big part of Montana. If a rancher loses a huge hay field, that's irreplaceable to him; he's out of business. If he's out of business, then Montana doesn't get that. The Yellowstone River is a free-flowing stream that brings huge amounts of recreational dollars to Montana. Fly fishermen come from all over the world to fish this river. So, what is right, what is wrong? I think that the riprapping should only be in areas that would protect the spring creeks and the rest should not exist, unless it is a highway or a bridge, or something that we need to protect them for public safety and access.... You see tons and tons of rocks dumped in there, forcing the river off to another direction. And some riprapping will force the river [to be] somebody else's problem. They have to, in turn, address that problem.... We don't want a Yellowstone River that is all channelized all the way down to Miles City. I mean, we just don't do that. (Segment II, Recreationalist, 2006)

You should see the springs; they are a national treasure you have to protect. I've seen riprapping, maybe along a quarter mile on the Yellowstone, in order to protect the field. I don't know if that is right. Personally, I think that is wrong, but in order to protect the springs, I think that is probably the right thing to do.... If the Firehole River was threatening Old Faithful, would they riprap it? (Segment II, Recreationalist, 2006)

Pretty soon you have a ditch, you know, rather than a river. In some cases [riprap] is legitimate, in other cases it's probably overdone. (Segment III, Recreationalist, 2006)

The erosion issue is a tough issue.... Are we going to armor the whole [river]?... What's the right thing to do if it's your 100-acre farm that you're going to lose?... If you look at the old maps,.... that river moves.... If I was a landowner along-side of [the river,] erosion would be a huge issue for me.... If you're the City of Billings and it's at your intake for your water system, riprapping near that might be a pretty important issue. Where do we go with that?... I'm sure that armoring the whole river is probably not the answer, because if you armor one spot, that force is going somewhere, somebody else is going to deal with that. (Segment III, Civic Leader, 2006)

Certainly, I understand the people that have property, and they want to try to preserve their property, and I respect that. But the fact is, the Yellowstone is a wild river, and,.... to me, it sort of comes with the territory.... [We should] try to achieve [a] balance, and not be overly regulatory with citizens [as far as]... what they can and can't do with their property, but, on the other hand, realize that, hey, you're not just doing something that's going to perhaps impact a little piece of property; you're doing something that could have potential impact on a resource that has significant economic impact, [and] social impact... on a whole bunch of people. So, people need to understand [it is] a lot broader than their little piece of property on the river. (Segment IV, Recreationalist, 2006)

It's a real fine balance, in my opinion. I have the utmost respect for other interests.... I know we have to work together. So, I think that's why it's important that we do strike a balance in terms of some of the things people are looking at. For example, putting the riprap on the banks...may prevent erosion of their property and their interests, but, if it's not done properly, it could have some sort of adverse impact on the fishery, which concerns me. And then it takes away from that pristine environment.... I like the fact that, [in] very few places do I see any man-made changes to the river. It meanders, it's pretty natural, and, as you can see [today], it's really roaring.... When it starts to lower itself down, some new side channels will [form], there'll be new obstructions, new fish habitat, and so on. (Segment IV, Recreationalist, 2006)

I've seen the devastation that took place south of Livingston on the Yellowstone because [the river] got behind the riprap, and then it took acres and acres away. And, to me, it took a lot of the beauty.... [The river] takes a long time to heal, but it will. A free-flowing stream is one thing, but...there's no more erosive practice than nature itself. And if you want to see [a free-flowing river], and you're not interfering with private property, that's okay, but I think we still need to help people protect their property from over-extension of the river. (Segment IV, Recreationalist, 2006)

I don't know, at this point, what you can do other than encourage responsible planning...and really being careful if you allow somebody to riprap. You have to think about the consequences....Some of the biggest problems here are these old bridges that constrict the river. They need to redesign those bridges, of course it would be millions and millions of dollars. (Segment V, Civic Leader, 2006)

Some of it was riprapped before we came. I know it is a controversial thing. You riprap here, and the water hits it and sends it across the river, and it does more damage to the guy that lives next door. You are sending the problem further down the river. I am slowly learning that... [but when] you see your own land disappearing, it is hard. (Segment V, Agriculturalist, 2006)

If there are some artificial ways that we can replicate the positive impacts of flooding, but still be able to mitigate the damage, then I'll try to implement them. (Segment V, Agriculturalist, 2006)

I would armor the banks only in extreme cases of emergency.... Otherwise, we will be like the rivers in Oregon where it is armored all the way, on both sides. It is bad.... I am against modifying the banks in any way except in extreme cases like to protect a bridge or somebody's house. I think that is the way it should be done. (Segment V, Civic Leader, 2006)

In terms of long-term health of those spring creeks...any time we clean the gravel no matter how we do it, the fish respond, the insects respond, and the fishing is better.... What would be nice is if we could mimic the natural flooding and wash all the silt out and that appears to be the natural cycle on a spring creek. Instead, we have armored the

banks and done everything possible to keep the river out. (Segment V, Recreationalist, 2006)

Nuanced Opinions of River Controls—2012 and 2018

That is such a tricky issue. I don't know... On one hand there is what I just said that when you are trying to stabilize your banks, you're creating problems for other people downriver, but... it's easy to say from a 30,000-foot view that you shouldn't be able to do that, but when you're sitting there with somebody that just lost their house and probably could have made minor modifications there that would have saved it, I don't know... but there obviously is a place for stream setbacks. (Segment III, Agriculturalist, 2012)

If people have... such values like a railroad or highways or a particular landowner has such values that they feel that they must do something, then we need to have two things. One is... insist that they get the finest engineering done that mitigates as much of the impact of that project as the possibly can on the river... And two, they have to compensate or citizens and other landowners for the damage that they're going to do because of their project... And the mitigation fund should be acquiring some of these areas that have been ripped in the past that need to be opened up for the river... [and] compensating people to allow the river to erode away their land... for their ability to live with the river in a way that's good for the river and the rest of us... Our best shot is to do as little tinkering with the river as we can, and to try to figure out how to make it easier for landowners to face the reality that some of their land is going to be taken away, and that's where I see a mitigation fund and flood erosion easements being a tool we need to try to bring into place on the Yellowstone River... and it could be private; it doesn't have to be government. If people don't want government, there's different ways to do that. (Segment III, Recreationalist, 2012)

My in-laws...used to have to buy a new furnace about every two or three years. It flooded their basement. But [then], KOA and the next campground down built some levees, and so [my in-laws] don't get that anymore.... [It's ok] as long as you're not building a dam completely across the river and impeding the flow. They're directing the flow when they build a levee like that.... I can see their point, having been flooded umpteen times. You know, you're gonna want to do something. And I'm sure they were permitted. (Segment III, Recreationalist, 2018)

You could probably control certain areas by backfilling with large rocks and stuff if it bothers the landowner enough. Other than that, it's just... It is a live river, and it flows where it flows. And people just happen to get in the way sometimes. (Segment IV, Civic Leader, 2012)

That's a thorny one. One thing that comes to mind, as far as cropland goes is, where there's a deposit of sediment on one side of the river, there could be a channel change that cuts into the other side. You can't really trade land across the river when the useful stuff moves from side to side. Well, it's a thorny issue. On the one hand it's private

property rights and the ability to make a living, and that doesn't seem like that's ever been easy, or ever going to be easy for ag and livestock producers. But the tragedy of the commons is kind of the flipside of that, where if you don't give the river what it needs by armoring the river to protect the cropland, there are consequences downstream and at other times for that sort of thing. (Segment III, Recreationalist, 2018)

I know that they're paying people not to riprap, I know they're taking some riprap out... It's a little dangerous for boaters... But as far as an opinion on whether it's good or bad... I, I, I see the people's side of the story, they want the river to take the land as it always has. And then if you own the land, I can see their point, where they'd like to kind of keep their land, so. So, um, I do not have a personal opinion on whether that's something that's right or wrong... The bass like the riprap... actually, there are riprap banks that we do catch a lot of fish on... bait fish and, uh, crawdads and stuff like that... So... sometimes... the deeper water makes for some pretty good habitat. (Segment III, Recreationalist, 2018)

My personal opinion is, we've got to have a good balance. The City of Billings sits on the Yellowstone River. There is no way we can let the channel of the Yellowstone River migrate through the City of Billings. Can't happen. It's just economically, feasibly, impossible. When we get down the river a-ways, and we get out of population, I think it's healthy for the river to migrate. So, taking those two snapshots that are very small, considering the whole river basin, there's just got to be a good balance between armoring, riprapping, or whatever you want to call it, and channel migration. There's got to be a good balance. (Segment III, Agriculturalist, 2018)

A lot of people are...thinking it's uncontrollable, and it should be free and just roam wherever it wants to.... And that's not my way of thinking. I think that...the Yellowstone needs [some control] [At one location] they weren't allowed even a permit to go touch it because of new-aged thinking... "Let the river go where it wants." ... "It's wild and free; let it be wild and free." ... that's the general consensus of the people that are younger than us.... They don't want to see the Yellowstone look like the LA River, and I totally agree. You don't want to see the Yellowstone or any of these rivers become just cement troughs. I really think that's people's perception of what we're trying to do, you know, [as if] we would just cement it and call it all good. (Segment IV, Civic Leader, 2018)

There are some places that should have riprap. Of course, they've done some they shouldn't do too... Once in a while, someone will riprap theirs and then water has got to go somewhere, so it goes across the river and over on someone else... when we lost a bunch... somebody riprapped the other side of the river, and the water had to go somewhere so more of it came over on us. (Segment V, Agriculturalist, 2018)

There's huge chunks in the valley here where... maybe about 10% of any given float, you're going to be along a not natural bank... In a way, it's hard to say whether that's really that bad or not. I don't know. I have no idea. I mean, if the river ran up against the cliff, you know... I mean you can see areas where the river would go up against the hard

riprap, then ricochet back off other way and start to erode that bank rather than that one. There's an area here where it actually went behind a couple of barbs and dug out behind the barbs, and now you've got this hard rock island kind of out in the middle of the river, this riprap island that's not even close to the bank anymore because the river just went around it. So, I don't know. (Segment V, Recreationalist, 2018)

The sad thing with these rivers is... there's no room to roam... In the perfect world you would let the river have enough area to swell and be itself... We're basically trying to keep the river in a certain channel. You know, Paradise Valley is not very wide... That river can affect a lot of things. You know, we basically work hard to keep it in the same channel... It's that same channel that hits the railroad bridges and the highway bridges to go under the highways, and so it's just not... it's not allowed to swell and be natural... Like I say, if it was a hundred years ago and we had better planning and understood that better, then we probably could've done some things to mitigate that. (Segment V, Civic Leader, 2018)

Section 4. Bank Stabilization: How We Do It

Riprap is a Known Strategy

Among landowners, and across all field seasons, it was easy to solicit comments about bank stabilization practices. From riprap to jetties and barbs, to natural vegetative solutions, landowners had clear opinions about effectiveness.

In 2006, many landowners simply described what they have done to their property, and several explained that using the large rocks had been the most effective and longest lasting method. Some landowners spoke highly of Bendway weirs. They explained the weirs were less expensive and more aesthetically pleasing. Some mention that weirs are good for fisheries. However, they cautioned that they must be installed correctly and can still disappear during high water. Some claimed that vegetative alternatives are better in terms of the health of the system and that they work well. Others claimed these “soft” alternatives did not work, especially because beaver can easily destroy years of efforts. Finally, some attributed erosion problems to stabilization and development projects upstream.

In 2018, participants similarly claimed that they had mixed results using vegetation for stabilization. Some said that the best solution was to use a mix of riprap and vegetation. They explained this technique was able to protect nature, and they believed it to be a more long-term solution as compared to other methods.

Throughout the three field seasons, civic leaders and recreationalists added to the comments. They often mentioned projects that were likely done without permits, or projects that would no longer be permitted (car bodies and scrapped concrete slabs). At times, it is a comical conversation that emphasized a “can-you-believe-it” interpretation of what people have tried to stabilize banks. At the other times, the participants were more matter of fact, leaving interviewers and analysts to wonder if the descriptions are subtle endorsements. More often, participants expressed their disdain for these “out-of-date” approaches, and they said they were supportive of regulations that resulted in “natural” bank stabilization solutions.

Notably, in 2018, one participant claimed a lack of understanding regarding why concrete blocks were no longer allowed.

Riprap—2006

The best way to fix the erosion is to slope the bank and put rocks on it, or cement, or stuff on it. I’ve done a stretch of it, probably 500 to 600 feet, and it doesn’t budge. But down in front of the jetty, and behind the jetty, where they had one of these rock piles, they’ve been kind of washed off, too. They’re not as severe now as when they first put them out...but they kind of make the water go out and circle. So that creates wash, too, in the back of it, and that’s what happening by my place. (Segment I, Agriculturalist, 2006)

I know of a spot down here, close to the state line, where years ago they tapered the bank down, sloped it and put gravel down on it, and had trees grow. And it's stabilized it pretty well. (Segment I, Agriculturalist, 2006)

I guess, directly, we do not deal with [erosion]. We have some tributaries that we have to deal with due to erosion.... [W]e have had to do some bank stabilization on [some of our major creeks] We use rock, approved rock by the Corps of Engineers....It is all native cottonwoods all along the Yellowstone bank...[and] the root systems help stabilize the banks. (Segment I, Civic Leader, 2006)

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The only riprap I've really seen that works is when they went down and [bull]dozed the gravel out of the river and pushed it up...sloped it...If you keep it nice and smooth, the ice doesn't seem to bother that.... It's got to be sloped so that it's smooth. But we've got the full force of the river because we've got a 90 degree turn. (Segment II, Agriculturalist, 2006)

You slope the bank, then you cut a two and a half key down into the gravel [and] backfill that with large rock. We put, I think, eight inches of gravel on the side slope and on top of that, we put a yard and a half of big rocks per foot. It was just riprap. (Segment II, Agriculturalist, 2006)

I planted grass along there and it's kind of sodded-up now. And we have one spot where it makes the curve, and the water hits it pretty hard. And I've had to put a couple of big rocks in there now and then, because it's trying to eat a hole into the riprap. If it would do that, it would just wash it out, like water. I watch that pretty close, [and] when it looks like it's pretty weak, we get another rock or two down there...I suppose maybe in 50 years [it] might disintegrate. I can see a little bit of that on that now. It's okay. (Segment II, Agriculturalist, 2006)

It worked. The place is still there. The river has changed and actually it has gained because the river went back north. So, I guess [the riprap] was a worthwhile project for us. (Segment III, Agriculturalist, 2006)

Years ago, we did a lot of rock work and that is the only thing that has saved half of the farm. (Segment III, Agriculturalist, 2006)

I don't know where he got those boulders from. He put some money into it, [and] he was able to get a pretty good tax break when he put those big boulders in the river down there....You've got to use rocks big enough to withstand heaving force of water, especially ice....[The rocks are] aesthetically pleasing....In fact, you'll hardly see them because the vegetation has covered them up now....If it hadn't been for that riprap, I

wouldn't own the land that I own now,...because the river would be in the middle of this field down next to the river. (Segment III, Residentialist, 2006)

You know, there is a lot of agriculture that is being affected by what the river is doing.... If it takes its course, it moves all over the place...It is going to do what it well pleases, but maybe we can stabilize it.... We put a lot of riprap in since [the flood] I have been here. Probably close to 500 to 1000 feet worth of riprap and we have applied for more. (Segment IV, Agriculturalist, 2006)

The riprap and the ironclad are the most effective if it is done right.... I am more for the agriculture and saving your property. (Segment IV, Agriculturalist, 2006)

You need to use big rocks. You don't want to put in small stuff, or it will wash away. It has to be done according to soil conservation specifications and all that. Big rocks on a bank are the best way. (Segment V, Agriculturalist, 2006)

Something that will work is hard riprap and barbs...None of that [soft riprap] has ever worked on the Yellowstone. I can see where it might work on a river or stream that is not as violent. (Segment V, Agriculturalist, 2006)

Riprap—2018

I think they're just going, "Well, we'll just go riprap the river at that point." But that it's not just that point, you need to do the whole area if you're going to stabilize it. Otherwise, it does just what happened to the railroad down here. They put all these structures in to stop the river from meandering and it washed behind them. And once it does that, it makes it 2 or 3 times worse or more. Yeah. It really takes it out and it forms a rock island for a while. Yeah, you can still see remnants of that down below Intake. There's some of those jetties that they made, and they didn't maintain them. And they got behind them and now it just went... They're out in the middle of the river... That's why you say, if you're going to do anything like that, it takes constant monitoring and maintenance if you're going to keep those things working. And sometimes they don't even work at all. They don't understand. It's pretty hard to design for anything that can happen on this river. If you get a 200-year flood like we had in 2011, that's not what you designed for. (Segment I, Residentialist, 2018)

He had a bunch of riprap... [Later], instead of the old riprap.... [they used] water bars kind of downstream at an angle so they're angled downstream... but you got to really have the bank riprapped. That last high water... cut in behind it. And they only let him go so far, you know... is it three hundred feet... He lost all that. That rock was out in the river, and it cut worse, you know. (Segment II, Agriculturalist, 2018)

My folks lost a lot of nice farmland in the river bottom from erosion, and it was hard to dike those days. And money wasn't there, and they didn't know how to do it. But now it's all riprapped, the whole ranch pretty much, but it still bothers out there... When it all got riprapped... my dad had been doing it off and on for years in certain spots, but when

the hillside slid in as you turn up the canyon, they took all that debris and threw it along the river and diked it for him. They had to have a place to put it... [this was] probably in the 1960's. (Segment V, Residentialist, 2018)

We've added riprap... Just rocks, big boulders... [but] but I have seen places on the river where people have tried to riprap, and it seems like they just hauled a bunch of rocks in and dumped them there. And eventually the rocks kind of erode down into the river, which I don't think is all bad, but at the same time it, you know, defeats the purpose of riprap if it's going to wash back into the river... We also... own the land against the tributary, which is Mill Creek... And we have done just minor things in high water season... once in a while, we'll have to maybe cut a tree out or something just to allow the water to go where it needs to... I'll just hook onto it with a tractor or use a chainsaw. (Segment V, Recreationalist, 2018)

And we are very concerned... with the erosion that we're having on the river... But the river rocks that Pete put in place to make a small barrier—and it was simply river rocks because we don't want something foreign either there—did a good job. But we feel like we're going to probably have to put more there in the spring, because this year was a good test. We lost a couple more trees, but they were on the verge of being lost anyway, were hanging there... I don't worry about the house so much. It's just loss of property and erosion... You know, common sense told him to place the rock there, the river rock. And we may have to get another load in this spring and get the tractor out and plant them there, because the University, like 10 years ago, whenever, they stuck sticks in... All of that was full of twigs... It never did work... the water came and took them away again. It wasn't effective... If we need to take more action... just putting those natural river rocks, you'll see them, it did control it... but it was \$10,000. I mean, it's money, where you'd go out with dirt and rocks and build a tree system, but that river is forceful. It's powerful. And there's no guarantee after that work that it's going to be sustainable... So, we are trying to use our head. (Segment V, Recreationalist, 2018)

Alternatives Strategies to Riprap

Alternatives to Riprap—2006

The jetty is a quicker solution. It doesn't take as much rock or cement. (Segment I, Agriculturalist, 2006)

They seem to be having pretty good luck with the jetties.... They are a little less expensive than completely riprapping the bank.... They seem to kick that water out, and it will silt back in-behind the jetty. (Segment II, Agriculturalist, 2006)

The barbs, they're looking to be very effective. We have one over here, [but I] haven't had time to get in the river with the boat. I wanted to take another look at it, to see how well it's working. It worked well last year. I think it's a good approach as long as it doesn't wash out the neighbor on the other side. (Segment II, Agriculturalist, 2006)

I kind of like the idea instead of armoring the banks, use barbs or jetties to try to move the velocity of the stream...you got to take into account the nature of the force you are dealing with, the water. Some techniques are just going to be less impacting, dealing with that hydraulic force, and they are going to be more effective. (Segment II, Recreationalist, 2006)

I've seen a lot of different things. In my mind, the riprap is the worst that there is because it just protects the bank at that location. Generally, it gets eroded behind it. You see those old riprap trails in the middle of the river eventually. I've seen the river barbs that come out and they're oriented upstream, and basically it diverts the flow away from the bank. These are navigable. You can still go over them in low flows or avoid them in low flows. They don't go across the river. (Segment III, Civic Leader, 2006)

The Conservation District encourages people to put the barbs out.... The barbs seem to be working pretty good, and then plant vegetation there.... I think [those methods] cause less impact downstream. (Segment V, Residentialist, 2006)

We actually looked at using riprap. We used to do a lot of riprap work....And it was just lining the bank...[to] keep the bank from eroding, but you don't...really do anything about that. The weirs...actually slow the water down next to the bank and you don't have to line the entire bank with rock or concrete.... So, it will fill back in with grass and trees.... It looks much better when it's done and matures. And it is less expensive than lining the bank in its entirety. We just felt that was the best option. (Segment III, Residentialist, 2006)

We put weirs in.... [They were] incredibly successful.... If it is done right, it works very, very well. We spend a lot of money and time and energy enhancing wildlife on a property like this that we are not compensated for. We do it because we like to.... I spent hundreds of thousands of dollars doing the project we did on the river, doing the weirs the way we did it, engineered right. (Segment III, Residentialist, 2006)

[Weirs] are a good idea. A guy...just put some in a while ago. They seem to be helping a lot.... In some cases, [weirs are preferable to riprap] [Now,] putting a weir in still causes an eddy behind it that I think would cause some erosion when the water gets that high.... You can see some kind of scalloped areas behind it. But it does push, helps push the current out away from the bank. (Segment III, Residentialist, 2006)

Bendway weirs...[can] angle the river 20 degrees and they gently move it across to the other side.... It's moving the river.... You can just see how it hits the first one.... Then it subtly moves it out to the second, third, fourth.... My experience has been the weirs create habitat. There's more fish behind the weirs.... The weirs are a blessing that's not intrusive, creates growth, creates fisheries. (Segment III, Residentialist, 2006)

We used Bendway weirs. I think we put in six of those.... We have had very good success with the weirs except one.... They simply keep the power of the water away from the bank. They don't wash out the side of the river. You don't ruin anything downstream,

which is a common belief. They don't seem to be like the hard stuff where you throw the current to the other side. They are gentler.... DNRC had some money a few years ago and they funded 75 percent of the weirs for the ditch company. (Segment III, Agriculturalist, 2006)

The Yellowstone is so powerful that we get water behind the weirs, and it washes behind them.... The placement of the very first one is critical. If you don't get it right, it will wash behind it.... That is the hard part.... The person designing those spent an entire year on that...[and] the next spring the river washed away 20 feet of river, and we were back at square one.... These were the most highly engineered weirs on the Yellowstone. They must have spent 200 hours on the planning, and they had two people on site watching the placement of every rock. So, there couldn't have been any more scrutiny on a set of weirs. It is not an exact science, but they work most of the time. (Segment III, Agriculturalist, 2006)

[I heard about] a new idea and in some places it really works. What they do is build a rock weir on an angle out into the river. The Canyon Creek Irrigation District has put some of those in, and they work very well. (Segment III, Agriculturalist, 2006)

Bendway weirs. They go into the upstream about a 45-degree angle maybe. You dig them in, and you run them back into the bank.... When the high water comes, it flows over the top actually, and it pushes that stream [away from the bank].... [The weir] doesn't cause that scouring effect on the edge. Where, if you put riprap out on the edge of the bank, it tends to scour and get deeper and deeper next to the bank... [the weirs are] much better than armoring. We've had experience with it—made a believer out of me. And these are high, pretty fastmoving waters. Yeah, it's been used a lot over the years. I think a lot of people weren't really thinking they would work, but they do. They actually do work. If they're put in correctly, and you have a big enough rock, and they're dug in so they're in deep, and the angle is correct on them, [then] they sure do work.... [And they are] cheaper than armoring.... You only have to have them every 150 or 300 feet, whatever it might be. So, you just build them, and we put in three or four.... The first year, high water actually ran over them, but they survived. It worked good. It worked just the way it's supposed to. You know, everything doesn't work the same everywhere, but a combination maybe—I was sure impressed with them. (Segment IV, Civic Leader, 2006)

Alternatives to Riprap—2018

We did until I put a big dike up there in '67 06 '68... I put a big dike where it washed out. I didn't dam the slough; you can't dam a slough up. But I put a dike where it washed out. And it used to flood 60, 70 acres out here. And then... we put a big dike in it, but it still comes down the slough but not enough where it will flood it.... It was on my land [so I did not need a permit]. (Segment II, Agriculturalist, 2018)

We've lost about probably a hundred feet along the river, but we did a bank stabilization... and now it's [doing] pretty well... weirs... There's a series of them that start up around that curve, go all the way down... every neighbors' got one [laughs]...

It's like fifteen hundred feet, I think. Don't hold me to that, but I know it's close... They didn't work as well at first when they weren't put in properly. You have to get the angle right... but we redid them one time and they seem to be working. (Segment III, Residentialist, 2018)

They are developing things like weir systems that have a better effect, that don't do quite as much damage to the riverside and to the flow of the stream (Segment III, Civic Leader, 2018)

We did a bunch of weirs and armoring on the bank... Oh, it's been twenty years ago probably. When we bought the place, we knew it needed a lot of work and pretty much started working to get the permits right after we got the place. It's been quite a process... We were losing a lot of land. And the previous owner had done some work, we had it re-engineered and just wanted to try and do it right so that it held up well and didn't affect anybody downstream as well... [but] we lost probably forty acres right after we had bought the place, and we had some pivots and the house that would have been in jeopardy... [in] 2011... We los[t] a little bit, but most of it we had done the weirs and armoring to where it worked pretty well... we have a bunch of weirs and then there's some rock and size concrete armoring in between the weirs.... There were some [older] jetties that were put in on the other side of the river that obviously shot it straight across to us. (Segment III, Residentialist, 2018)

Riparian Health and Vegetative Alternatives—2006

We do have erosion. This riverbank, where you noticed all the brush, if we hadn't been putting [brush] over that bank for thirty to forty years, that bank would be over here in the middle of the street. [The brush] stops the erosion.... They will have to do something about the bank, down here. [With] another big, heavy rain...it is going to wash it out. (Segment I, Residentialist, 2006)

I don't want that bank to wash away.... So, I put in a lot of Daylilies, to hold the soil. They are real good to hold the soil.... Most of these people cut the trees down and put in grass, but the tree roots hold it so that is why I wasn't about to have my trees cut down. (Segment I, Residentialist, 2006)

We had a hole starting in the bank. I took some Russian olives and set them over the bank. I set the root on the next tree on the limbs and kind of stacked them up. We raise hay barley and wherever we plow a ditch, we would have to swath through there, because you have this hay barley in the ditch. I baled off the hay barley when it was green with no twine. I dumped that big green bale on the Russian olives and spaced them out. The next year I came back [and] it was all silted up and kept it from washing away. It was building and [it] protected the bank.... If they could take the Russian olives, which are basically a weed, and clean them out [it would help]. All of the limbs and leaves collect debris in the water.... I think they should take a stretch of water and try it. What if it worked? It would be a cheap fix. Look at a beaver dam; parts will wash out and they repair it. This system here, you may have to have Russian olives or willows sitting there to put back in, but you

could repair it. If it doesn't work, then figure something else out. I think it is worth a shot. (Segment II, Agriculturalist, 2006)

We converted it all to grass and in order to conserve the banks. We've let [the] creek grow wild and planted trees along there and planted shrubs and bushes to hold [the bank].... Those [cottonwoods] are just seven years old.... And these guys are 70 years old, these big ones here.... They just do so well down there and anything that grows on the bank I just encourage it's growth because it holds the bank. (Segment III, Residentialist, 2006)

We sloped, with a little bit of dirt, and put some grass clumps in there—some snake grass [and] Bermuda grass, and then we put willows in there. Last year, we had one of the biggest floods we had ever had, and it held up just fine. I have done some on my property, but I put small sandstone, small, and [I] mixed dirt in with it, and it held tremendously. (Segment IV, Recreationalist, 2006)

I don't know that there is a whole lot you can do [about erosion]. The river starts to move and... you can plant trees. That is probably what is holding the dike together right now. Tree roots are a great thing. (Segment V, Civic Leader, 2006)

[Riprap] can divert water. It can shift the problems up or down.... The reason that I probably might not do the riprap is I'd lose ten years of vegetation that's out there since the last flood and the vegetation is as good or better than hard riprap... [and] once I talked to some people who explained that to me, I don't really want to tear it up to put some rock in... but [the information] didn't come from any of the [government agencies.] (Segment V, Residentialist, 2006)

They have some new things they are trying. It's a blanket thing, and they plant willow trees in it. [It is] working on small streams, but it won't work on the Yellowstone. The beavers come along and eat the willows off that. (Segment V, Agriculturalist, 2006)

Try to use natural solutions first as far as planting things.... Layering the bank, anchoring root wads in the bank. (Segment V, Recreationalist, 2006)

I think you have to have rocks. If you do it right with vegetation, I think you could do a pretty fair job. I could show you on our place... one place where it has worked very well with vegetative growth, but [it doesn't work] in every place.... I think vegetation with rock would be a great way to go, so long as it's done in a way that you're not going to cause damage downstream from you. (Segment V, Residentialist, 2006)

Don't be too hard on the people that live on the river. I don't have the money to make big changes.... I had a bunch of cottonwoods growing and the beavers came and ate every one of them. There went my stabilizing.... [The beavers] are really destructive. I am trying to keep this place.... [even though] the moose come, and they eat everything they see, I am not going anywhere. I am going to stay here. (Segment V, Residentialist, 2006)

Vegetation is one of the key factors [in helping with erosion,] if it's done...right. (Segment V, Residentialist, 2006)

There is only a certain amount of [stabilization trees will] do. You try and get willows started in a sand bar...sometimes that works and sometimes it doesn't. (Segment V, Civic Leader, 2006)

[The river and the riparian areas are] less healthy for two reasons. One, there's been a lot of development taking place—I'm talking the entire river, not just around Billings. And [two]...miles and miles of channelization of the river...that very seriously compromises the riparian zone. So, sure, it's gone downhill a lot in the last 30 years. (Segment III, Recreationalist, 2006)

I think that the erosion problem...is a result of stream straightening. You don't have the cottonwood growth to hold the banks and keep the erosion down. (Segment III, Recreationalist, 2006)

I think good riparian management is probably the major way that we keep erosion down. There is a lot of shrubs and grass. (Segment V, Agriculturalist, 2006)

Riparian Health and Vegetative Alternatives—2018

There's been erosion on the river. Some of it has been our fault as farmers, and some of it we have learned to... well, I leave a buffer zone now between fields and the river for willows and trees... Approximately a hundred yards, maybe 75 yards between the fields and the river... I suppose [I've been doing that] for the last 40 years probably, just because early years, you know, we didn't know better. We leveled the ground right close to the river and it started going away so the field went away. And we spent money to level it, so I decided well, this isn't any good. So, we started leaving an area and try to leave it there... It does [help with erosion]. There's enough roots and things there. It isn't the total answer, but it's better than leaving it bare and sandy...I just want to do try to do what I think is good for the long term... for the future, there's a riverbank down there that's accessible and is holding the water kind of in the river instead of making a marsh out of the whole area here. I don't know... I mean I'm not involved in any practices maybe not even very firm on the ones that I believe in, I mean that I believe in just for myself. I arrange it so that it's convenient for me. (Segment II, Agriculturalist, 2018)

We have places where we literally cut down all the trees and got rid of the shrubbery along our river to make it a beautiful deal, we can't be doing that anymore. We have to transplant stuff back in there to stop the erosion that we get from Mother Nature... And I'm sure there are other ways of doing it but helping Mother Nature along by planting shrubs and trees back along the river, that would do a lot of it. (Segment III, Civic Leader, 2018)

I'm sure it limits the erosion with the good grass, and even the Russian olives. The more vegetation, the less erosion I believe, so that's all good, I think. (Segment III, Residentialist, 2018)

There is a lot of rock, a lot a lot of rock in there, thank goodness. And the rock as kept some soils intact, and I have planted more trees in order to stabilize it. As things go away, I keep planting something back in place... it helps. (Segment IV, Residentialist, 2018)

We did put in quite a bit of riprap, and they said, oh, plant willows and this and that. High water will tear all that stuff to pieces. It will take trees this big around. So, what's a little willow going to do? ... You can plant all the trees you want to; it just don't work. And I know that's part of the criteria. When you do riprap, you are supposed to plant trees and all this or willows, but it's a waste of time. Gives somebody a job [laughs]. (Segment IV, Agriculturalist, 2018)

It seems like there's been a little bit of an increased use of sort of smart bank stabilization, you know, where they're sticking the root balls of trees out and the trunks way back into the bank. And that seems to work better. (Segment V, Recreationalist, 2018)

The other thing we're doing nowadays, we're not doing as much riprap, like I don't do it at all. My parents' place, they've had some erosion due to the last flood, and we're doing a more natural-based bank stabilization, you know, planting and buildup, that sort of stuff. Of course, that costs a little bit more and it doesn't necessarily last as long, so that's an ethic question, right? Not everybody is going to do it. Some people are... I think we can solve for channel migration via allowing people to do that sort of stuff. (Segment V, Recreationalist, 2018)

Older and Nonpermitted Strategies

Other Things that People Do—2006

There isn't too much to do about [erosion].... They piled debris from the old high school right here on the riverbank and that is what protected our riverbank. It stays...permanent. And when the water comes down, it keeps it out. (Segment I, Residentialist, 2006)

When Grandpa was actively farming, we had this one spot that would always want to erode. And, he'd just go get cement, or iron, or anything—just a bunch of junk car bodies and throw it in there—and it'd stop.... You have got to have something solid, like concrete, or lay down a bunch of rebar...to where it isn't going to move. I don't really know what the answer is, but I know that's just we'd do. Grandpa would say, 'Go get the cement, and put it in that hole that always washes.' It, really, never did get any worse. (Segment I, Agriculturalist, 2006)

This one contractor was taking out houses and stumps, so he asked me whether he could bring these foundations down here along the river. But pretty soon [others started

bringing] junk and trash.... I couldn't be down there all the time. Signs didn't do...[any] good. So, I got after it, and I cleaned it up, and burned all that I could. And then put all the cement on the edge, and that part works. (Segment I, Agriculturalist, 2006)

They keep saying plant trees to stop erosion and the best riprap they have ever had is old cars. They have been there forever, and they are mashed but they are still there. (Segment II, Recreationalist, 2006)

Leave it like it is. It has been working pretty...[well] for quite a while. I say that the old cars are the best riprap they ever had, if it is up against the bank. We have been looking at them so long, they aren't unsightly to us. (Segment II, Recreationalist, 2006)

We can get riprap for nothing.... People are glad to get rid of it because they have to pay to take it to the dump. Whenever [my husband] sees a new project going on...he'll stop and tell them they can come out and dump it here.... But we don't put anything in the water that has any steel rebar in it. Absolutely not.... That's just plumb outta the question because people come by here in a rubber raft. A three-quarter-inch piece of rebar sticking up—what do you think that would do to a rubber raft? (Segment III, Agriculturalist, 2006)

We were all out on the riverbank...and [one man] asked, 'What's the problem with car bodies?' And [an agency man] says, 'It's the oil and the rust.' I said, 'Yeah, I can understand that, but when I go to Billings and this old vehicle in front of me... [is making] a puddle of oil.... Where does that go when it rains?' He says, 'It goes in the river'.... That kind of tells me that a 100,000 people make it right, and one individual makes it wrong. (Segment III, Agriculturalist, 2006)

We used to just push cars in the river. I remember along the Milk River.... What an ugly sight, but it worked. There were places they'd have half a mile of cars piled up, just push them off into the river for riprap. They were allowed to do that at that time. They're all gone now. (Segment III, Civic Leader, 2006)

I don't want old cars down there and I don't want any concrete riprap. If it could be done naturally, I don't want the Yellowstone turned into a ditch. We were down in California and the Colorado River is a ditch and it made me very sad. (Segment III, Agriculturalist, 2006)

Fortunately, they've changed the rules of riprap. You don't get to throw your old car bodies and things like that. When you start dealing with riprap, that's not...[natural]. I would rather do it naturally, if we can. (Segment II, Civic Leader, 2006)

Definitely, they should not be using old cars or junk or tires that move suddenly. [They] are dangerous and don't stay where they are put. I'd just as soon not see concrete with rebar. I'd just as soon not see concrete at all. If they need to stabilize those banks, then I'd just as soon see them use some natural rock or try to establish vegetation to do that. With a river like the Yellowstone, you're never going to get vegetation to hold the

Yellowstone back anyway. But, if they really, really have to do it, I'd say hard, natural stone is the best way to go. (Segment II, Recreationalist, 2006)

At least they don't use old cars anymore. It doesn't really bother me, [but] I'm glad they don't do it now. It's almost become part of history. There's a '56 Ford in the bank! I'm really glad they don't do it now. If you had a chance, it'd be nice to remove some of them, but they're part of the town.... They call it the 'Drive-in on the Big Horn,' where there's 50, 60, 70 cars, but I'm glad they don't do it anymore. (Segment IV, Recreationalist, 2006)

I'm just glad they finally decided not to use car bodies anymore [for riprap]. You still see a few of them when you go down... We just have to learn that this river will not stay pristine unless we take care of it. (Segment V, Recreationalist, 2006)

Other Things that People Do—2018

He'll take concrete that doesn't have any rebar, and he sets it up on the bank, and when it rolls off it serves as riprap because the Corps won't let you riprap it anymore. But if it's sitting on his ground and it happens to get in there because it washes away, well then it serves as natural riprap. But he makes sure that there is no rebar—like sidewalks, a lot of sidewalks don't have rebar, so you can dump it there. (Segment I, Civic Leader, 2018)

Well, it's illegal to put concrete. You know, people will break up driveways and they'll put it in the river to keep the water from eroding, and that is illegal to do, but if they dump it up on top and then the river comes and wears it and it falls in, that's ok. There again, government thinking. (Segment I, Recreationalist, 2018)

Our son when he was in high school, he used to go right straight down on the riverbank over here, where there's old concrete and stuff from when the high school burned down and they rebuilt it, they threw it over the riverbank to build up the bank. (Segment I, Residentialist, 2018)

I did a little experiment one time. I went down there and put like haybales or strawbales down in the water. And then, when they soak up with water of course, the river will go over the top of them and it creates silt. And it silted in-behind the bales, and pretty soon I had a tall grass growing, and I had some willows growing on there. And two years later they cranked open these hydroelectric dams that just cleaned everything right out. Took all of that stabilization. I was just experimenting to see if you could do it, and it was working. I mean stuff was starting to grow in there again, and those bales held the ground and the silt, and everything was coming in there—Russian olives, and willows, and that tall grass was growing on those bales... I don't know if I should have been doing it in the river, but I mean it was stabilizing that thing. But then when they cranked the dams open, it just took it all out. (Segment II, Agriculturalist, 2018)

But now last year, we had quite a bit of high water again... And for the first time in my lifetime... the river changed at our inlet—totally changed... A rock fell off a cliff

upstream. And then a snag laid in there, and it was diverting [the water] back out... My neighbor and I went up and he says, “What are we going to do? ... You got any ideas?” I said, “I’ve got one, but... I don’t know if they’ll throw us in jail or what they’re going to do!” [All laugh] ... So, I contacted Darryl Wilson with Yellowstone River Parks, and I said, “Darryl... We’re in a pickle... Would you give us access in through the park with a track hoe?” ... And he says, “Do what you’ve got to do.” ... So, we went in there and got that [rock and snag] out. And [we] got the water coming right at us [which] cleaned out our inlet—got the silt out. We actually force-fed it. (Segment III, Agriculturalist, 2018)

You can’t control that water. We tried; one night we were out until midnight trying to get riprap in enough to stop it. We were dumping concrete head gates, which is now against the law, but we were trying to save that. And they were huge, and as soon as they dropped in that water, you could hear them going clunk, clunk, clunk. That river was just rolling them. They were probably weighing two tons. But you would hear them just rolling down. (Segment IV, Agriculturalist, 2018)

You know, at one time we used old cars. We had an old Ford down here in the riverbank. And we used to measure the depth of the Yellowstone by how far the water was up on the windshield of that old Ford car. And now they got numbers on the bridge, we got to look at those. But I miss those old Fords [laughs]. (Segment IV, Civic Leader, 2018)

That old river used to come up high every year. And in doing so, it would run across these guys’ land...and cut off a whole bunch of their grazing. So, they took a Cat and got in there. And nothing was ever said, but they got in there and closed those seams where it would run [away from their land]. It probably saved, oh, 50 acres of grazing land for their sheep, so they were happy. And nobody ever said a word. This was a long time ago, you know.... Now, they’d string ‘em up. These environmental cops would come along and string ‘em up. (Segment IV, Civic Leader, 2018)

Cars? [Laughs]. That worked really good. That was great stabilization—It worked! (Segment V, Agriculturalist, 2018)

Most of it, we did ourselves... And we just used material that we had, you know... take some dirt and mixed it with some gravel... I’m sure that somebody could find a problem with it today. Because things have changed a lot since the early 70’s... as to what you can do, and what you can’t do, according to someone, somewhere... (Segment III, Agriculturalist, 2018)

People used to use concrete, and car bodies, and that kind of stuff. But you know, they’re not allowed to do that anymore, and I can see why. I think that there’s only certain types of rock and stuff that you can use to prevent erosion now... Lots of times I’ve fished in a spot where there was old Cadillacs and Buicks. You get hung up and say, “Oh, got a Buick”.... I think that probably the not using car bodies and that kind of stuff is an excellent idea... I think concrete would be okay, I mean I’m sure they don’t allow it anymore, but I don’t think concrete and rebar would hurt anything. (Segment III, Recreationalist, 2018)

Section 5. Bank Stabilization: Decisions and Consequences

Participants identified several concerns and complications that must be considered when contemplating bank stabilization activities. The concerns focused on these questions: Will it work as intended? How long will it last? How much will it cost?

Many participants stated it was extremely difficult to predict how the river would react to different projects. They often cited their own experiences of how bank stabilization projects apparently caused a negative impact down river.

Bank stabilization projects designed to protect public infrastructure—mostly roads and railroads—along the Yellowstone River were identified as the main culprits when discussing the impacts of bank stabilization. Others viewed these large projects as necessary to protect community interests. Some explained that large stabilization projects seemingly happen without the same permitting constraints and timelines experienced by smaller landowners, even though the large projects apparently alter the river in significant ways.

Two concerns were often tied together: costs and longevity. Participants who considered stabilization projects often stated that these two factors were their primary reasons for not pursuing bank stabilization, despite needing such projects to protect property. In 2006 and 2018, stabilization projects were often deemed too expensive.

Another way to “live with” river bank erosion was explained as learning to simply accept it and allow it to happen. Comments in 2012 and 2018 revealed the topic of channel migration easements was becoming of interest among participants; some explained the specific pros and cons of implementing such a program. In each field season, a few participants noted that the only the “wealthy” folks coming to Montana had enough resources to engage in conservation-minded practices.

Fixing Problems/Making Problems

Unintended Consequences—2006

There [are] guys that put in little rows of rocks and stuff to push the river away from their bank, so it's going down like this. This guy does it, this guy does it on this side, so it kicks up more that way from them doing that.... It pushed the river that way, so then those guys over there pushed it back this way. (Segment III, Residentialist, 2006)

It cuts into one side, and it changes the [bank] across the river. For every action there seems to be a reaction. (Segment I, Agriculturalist, 2006)

The river is the river, and you are not going to control it. If you are doing something here, it is going to affect something, or someone, down there. High school geology taught me that. (Segment IV, Residentialist, 2006)

In my opinion, most of all the riprap projects...have been done wrong. It's because people have not taken the time to assess, 'What am I doing? What do I want this to look like? and What are the true reasons [why] I am doing this?' You know, if you analyze all those things before you go in there...hopefully you'd come to the realization that you'd give the river some room. So that when it comes its day in June that it needs to go over the banks.... It has...[somewhere] to go. You could stack the dirt up 40 feet high and just keep narrowing it up. Well, the river is going to rev up so fast that Jesus Christ himself couldn't stand on the bank and keep the bank from disappearing.... I mean, we just got to pay attention. (Segment I, Agriculturalist, 2006)

Taking a look at the entire river is the right way to go. Sometimes you can make individual changes, and you are not really sure of the effects up or down river. I know we have a channel that has changed three times in the last fifty or sixty years. It goes from one side of the island to the other. There has to be something upstream causing it to do that.... For example, when the state highway department built the interstate bridge down here, we developed an island that had never been there before. I am sure they had no clue that was going to happen. (Segment I, Civic Leader, 2006)

Erosion is constant.... It is influenced by runoff from the mountains.... [And,] with this soil composition here, you can see where this basin has stretched. [The river] wants to travel. People built close to the water, and now they are trying to armor the river to keep it from traveling, and it is a [lost] cause.... The problem is, if [we address erosion] here, we're affecting everything downstream. They have learned that...small changes on this river cause major changes downstream.... We have a bridge out here that [the river] flowed straight through the piers. It now flows [parallel] to the bridge. Minor changes have had major effects on that river.... You can't control this river.... One year, this guy lost 600 feet of agriculture land. (Segment I, Civic Leader, 2006)

I have seen a number of riprap problems. The irrigation project did it to keep from losing ditches. If you happen to be on the other side of the river you say, "I wish you wouldn't do that." (Segment I, Agriculturalist, 2006)

If somebody had done that on the other side, I would be mad because why [should they] push it over to my side? (Segment I, Agriculturalist, 2006)

When you look at [this] bridge, there's twenty feet of silt built up there. If it isn't there, it's going to be in the dam. If it isn't [in the dam] it's going to be in the Missouri, or the Mississippi. That's why I believe in riprap to stabilize the banks. I believe in rock jetties. But if you put a rock jetty on one side, you've got to stabilize it on the other side.... And, if you don't stop it, then it just eats, and then it starts meandering on the other side. (Segment I, Agriculturalist, 2006)

My gut tells me...if they look at the entire river, they get a better feel for what [upstream] changes can do [downstream]. I have heard stories about how, all of the sudden the channel changes, taking away a bank upstream, and all of the sudden a farmer has lost 100-feet of his field. I have, also, heard stories about someone riprapping their bank, and

pretty soon you have another adverse effect downstream. The natural course of the river has been altered. (Segment I, Civic Leader, 2006)

People have tried to put in rock jetties because they were trying to save their land. Let's say they put it on the left side of the river.... He didn't think about what effect it had when it went to the other side. So, the guy on the other side says, 'Oh, wait a minute, now mine's starting.' So, he puts one. We can learn from that. There may be ways that we can protect [it], and I really feel that it should be protected.... [but] over the years even those [rock jetties] have been destroyed. (Segment I, Civic Leader, 2006)

Riprap works pretty-well...I think the river is going to do what it is going to do....I could riprap this, and I have always heard that if you do that, it will take it someplace else. (Segment I, Residentialist, 2006)

That's another problem; you riprap on one side, and you're shoving that water back over on another guy. He's going to be a squawking.... It wouldn't do...[anything] to the rivers at all, but it would take away from the natural beauty of it. I mean, you drive down the river and it is all rocks, which aren't supposed to be there, you know. (Segment I, Residentialist, 2006)

You have a bend in the river up here by Billings somewhere and they put some riprap here because it's cutting. They put a bunch of riprap in here and all it's doing is...narrow[ing] it down. It just creates more energy, and it just erodes over here. (Segment I, Agriculturalist, 2006)

Well, it can stabilize the bank, but you're changing the hydraulics of the stream, so you're going to get a change somewhere else. You're going to deflect it somewhere else or change the deflection somewhere else...and it's going to be hitting the bank differently someplace else. (Segment II, Recreationalist, 2006)

I don't think they are going to be able to say, 'I am going to keep this point where it is.' [Not with] riprap or whatever.... They may stabilize it there, but they will move it somewhere else. (Segment II, Recreationalist, 2006)

You get a guy with more money than he knows what to do with, and he's paid tens of thousands of dollars an acre for land along the river, and here comes the damn river and starts washing [his land] away. Now he can afford to do something about that, and he will do it. What he doesn't understand is that the degree to which he does that, it is going to hammer the guy downstream. So, he has [created] unintended consequences which he's not responsible for—he should be. (Segment III, Recreationalist, 2006)

The natural processes of the river [include] erosion and deposition.... I understand why [people who live near the river] would [want to stop erosion], but from a geologic or scientific viewpoint, once someone affects one part of the river it will affect another part of the river. There are consequences.... If you put in...riprap, then that may cause scouring in some places and deposition in others. You may be affecting your

neighbors.... Those types of things need to be considered.... I think it is important to approach this from the scientific point of view. (Segment III, Civic Leader, 2006)

Even in Yellowstone County, we have a lot of extreme bank armoring. You can see it in very site-specific areas where the armoring has caused erosion just right downstream from it. The velocity increases where the bank is armored, and you get swirls and eddies downstream that cut into the bank.... On a site-by-site case you can see evidence of how armoring really does change the dynamics downstream. It's not [only] development; it may just be a farmer trying to save his field. It doesn't have to be a subdivision, housing development. (Segment III, Civic Leader, 2006)

If you stabilize the bank in one area and...don't really do a good hydraulic evaluation, you're going to erode something downstream. The river has to dissipate energy, and it's going to dissipate it by eroding the next guy's bank. If you graze off all of the riparian plants along the river, you're going to have a whole lot more sediment...than if you had good turf, trees, and all things that attenuate flood flows and that don't allow a channel to migrate as rapidly. (Segment III, Civic Leader, 2006)

Erosion [happens] on the banks...which is too bad.... You hate to lose areas of the ranch, but [if you] put structures in the river, and try to push the river over, you effect somebody else. So, it's a no-win deal, really. (Segment V, Agriculturalist, 2006)

Unintended Consequences—2012 and 2018

We do a little tinkering here, which causes the next guy to do a little tinkering there, which exacerbates on further down, and you concentrate that energy of the river further down the river. So suddenly then you've got everybody who needs protection, and then you have a big government project which, in the long run increases the flooding problems for everybody because you've tinkered with a system that you shouldn't be tinkering with. You should be living with it. (Segment III, Recreationalist, 2012)

It causes a, what, action and reaction or something like that. (Segment I, Civic Leader, 2012)

I would like to [stabilize the banks], but I don't know how to do it without changing the course of the river, because that's the problem with it. And you know, we've seen the impacts of people doing that upstream. Well, I shouldn't say we personally, but like Alexis's parents can remember where the river used to flow before riprap was put down on the property next to us. And then you know, I mean all you're doing is creating somebody else's problem down the river. (Segment III, Agriculturalist, 2012)

Obviously, every time there is a bank stabilization project, it pushes problems downstream or creates problems downstream. So, it dominoes. So... if I were king, I would change how we do bank stabilization and when and whether we decide to do bank stabilization. (Segment V, Civic Leader, 2006)

Mr. White down there who had put a berm out in the river... might have caused probably some of the [erosion] problem [on my property], I don't know. (Segment V, Residentialist, 2006)

We've looked at that and we know we're going to lose a bunch [of land] ... So no, we are not going to ever do anything for it... Me personally, I don't think that human beings are smart enough at this point to do anything with that river but mess it up. Yes, there has been old cars up and down the river that have piled up. Yes, I can remember a neighbor, you know, they've spent millions of dollars putting riprap into it. Has it worked? Maybe. I'm not that old yet. The new stuff I kind of like. If we're going on somebody else and they've made a nice backwater, is it going to last forever? Probably no. That river, if they leave it alone and never dam it, it will be stronger than any humans. Because you're going to get it back someplace... If you take it out here, like I've said... guess what, when it comes back around over here, it leaves it over here. It just depends upon whose land they leave it on [laughs]. (Segment II, Recreationalist, 2018)

Where the river's been squeezed it kind of has to run deeper and faster to fit in the river. Any change in one place is going to show up as a change somewhere downstream. Predictable or not. Intended or not... Channeling the river, creating faster water, somewhere downstream is bound to cause some erosion that may not have happened otherwise. (Segment III, Recreationalist, 2018)

Interviewer: So, have you contemplated protecting your bank? Participant: No. No. Because we all live downstream from each other, and it's a river, and rivers do what rivers do. (Segment V, Civic Leader, 2018)

The things that the fluvial geomorphologist and the conservation districts describe is that the river between Billings and Laurel is the most channelized section of the Yellowstone River... So, what we know is if you riprap or armor a bank of a river like the Yellowstone, which is a free flowing, gravel bottom river with huge power, and it hits that armored bank and it bounces off and collects its force and hits the bank downstream. So, there's an unraveling of a river as soon as you start riprapping a river. But what caused, I think, that oil pipeline break was because the channel of the river was going down rather than sweeping back and forth as a snake. I don't think any fluvial geomorphologist would argue with me on that. (Segment III, Recreationalist, 2018)

Infrastructure Protections

Public Infrastructure—2006

I think that [we should protect] the infrastructure of the area. Roads are for an irrigational practice [and] we have to have those. (Segment I, Civic Leader, 2006)

The good old Yellowstone is a cantankerous old thing. That river is wonderful, but it's also wonderful to watch it. It's going to go wherever it wants to go. I'm kind of torn...because we have people [who] defy us to do any riprapping, or to save a public

structure, or anything like that. We're not supposed to do that, I guess. That's what I'm hearing. But darn it, you've got a two-million-dollar bridge sitting there, and the thing's washing out, you better do something. We can't shut all the traffic off.... This bridge down here was in jeopardy. So, they brought in a lot of rock and fixed it. It's fine. We had it protected.... We've, [also] had some subdividers that have gone on their own and put in some Mickey Mouse things, jetties. But it really didn't upset the river a whole lot; it's got a mind of its own. (Segment IV, Civic Leader, 2006)

You can't go in and interfere with the river anymore. I agree that if you're going to go in and flood someone else or hurt something—fix mine and flood you— that's not good.... [But] when the road washed out a few years ago, they could have stopped that. (Segment IV, Agriculturalist, 2006)

This bridge here just south of Columbus, it used to have a lot of riprap on it. And, four or five years ago, when we had the high water, it took that riprap away. And it was big riprap. And now, I'd say it's underneath that bridge someplace.... That whole bank—it's just a small piece of private property—but that's going to just keep eroding away to the road. And that's a pretty important road.... I think they have to have an aggressive riprap program. We've got infrastructure that needs to be protected.... Let us get in there to protect [it].... [Let us] put some large rocks, riprap, in there to protect those things. Most ranchers cannot afford to riprap...and the river just eats away and takes away, but roads need to be protected. (Segment IV, Civic Leader, 2006)

I think the people that abuse the river are the Highway Department and the railroad. They do whatever they want. See, they don't have to come to the Conservation District and get a 310 to do anything on the river.... They just go. (Segment I, Agriculturalist, 2006)

You know how the railroad would riprap theirs without permits? They'd just go back 15 or 20 feet and build a great big trench and fill it full of rock. It's on their property... [and] above the high-water mark...Someday, when the river washes away, they'll have a barricade. That is the plan, a pre-plan. It...[isn't] a bad idea. (Segment II, Civic Leader, 2006)

[The] Army Corps of Engineers needs to get involved and shore up these banks, but they won't do it.... They'll let the river run its course. But, you see, with this one particular area, when the river eats out the rest of that field, there's not much until the railroad tracks, and you don't mess with BNSF. Oh, yeah, I can foresee that once the river has eaten all of that field out, BNSF will come in and they will shore that up because you can't wash out the railroad. It doesn't matter that people lose their crop ground, but don't do anything to the railroad. (Segment II, Civic Leader, 2006)

[Near] the population centers...the County and State government people come in and do what they want. They don't need permits [for bridges and roads]. They just do it. That one project on South Billings Boulevard would have more impact on the river than 50 private people. (Segment III, Agriculturalist, 2006)

Public Infrastructure—2012 and 2018

We need that railroad... And we need our highway infrastructure. You know, those things are important to us as a society economically and socially. So, they have impacts, and the impacts generally are on the environment, the environmental systems, and individuals who had no control over what was going on. (Segment III, Recreationalist, 2012)

Basically it [the river] ... keeps washing the banks... to the south. So, it's next to the railroad in places and a lot of manmade structures and things like that, so they got to protect those kinds of things. (Segment II, Recreationalist, 2012)

The only one that seemed to think you can just go haul rock and dump it in the river is the railroad... [After] a couple of years ago when that train fell in the river... they're trying to get it passed now that railroad can go ahead and do it, you know, and don't have these wrecks. But the railroad doesn't want to go out too far because it's going to take too much riprap... so I can see why they need to have the riprap and have the river shored up if that railroad is going by. We don't want those oil cars in the river, leaking. (Segment II, Agriculturalist, 2012)

It's probably within 50 feet of the roadway right now, so it's kind of an emergency deal that they're going to have to rebuild the bank out and riprap that section... And the highway department has had to riprap and do some work up toward Emigrant Creek along the East River Road, and if they wouldn't have, we wouldn't have an East River Road there. So, I mean, it's a necessity. (Segment V, Residentialist, 2018)

The only thing that protects it through that area is the railroad... And the railroad, they get riprap and make sure it doesn't wash them out... it's a big part of our infrastructure is the railroad. If you cut them out of our transportation picture, it would be huge. (Segment IV, Civic Leader, 2018)

The railroad has been riprapping. They come through here about three times a week, at least two times a week, with a whole trainload of rock to keep the tracks intact. (Segment II, Agriculturalist, 2018)

They say the only one who can do anything to the river is the government and the railroad. And the railroad has a real tough time. It comes out of us, and it shoots right straight across the river into the NP, and they riprap and riprap. I mean they put... Jillions of yards of rock and... Trainloads of it, of granite in there pert-near every year. (Segment II, Agriculturalist, 2018)

I still don't know how they [the railroad] got away with altering the course of the Yellowstone River... the main channel... And I bet the railroad is still pissed because it cut right over against the railroad tracks and for about a mile, there, they've had to riprap the railroad tracks to keep the river from taking it out... And they continually, every year now, have to do it... Because the river came down and just made a big loop and came

back around and came down. And they just cut straight through it and dammed it off at the upper end. It's changed a bunch since then. I mean it's cut back and forth through there... They [the Hook Ranch] hauled riprap day and night for about a week straight [in 2011]. They saved the buildings, but not by much. I don't know how much that cost them, but... I think they probably could have rebuilt the buildings and stuff for what it cost them to save them. (Segment II, Recreationalist, 2018)

Beyond Us Little People

Cost and Durability—2006

I have no education on how to tame a river, how to keep a river in its boundaries. I think it can be done but it would take quite an investment... The last I heard, riprap was \$125 a foot. It doesn't take long to eat up a life savings. There is no guarantee. It has got to be something on a larger scale than an individual can do. The government will have to do it, or nothing can be done. The county can just hold a little here and there.... I am sure there is engineering out there that can fix it, but just putting a little bit here and there isn't going to do it. (Segment IV, Agriculturalist, 2006)

What we call the June rise is going to erode... somewhere. And, if it ever gets started on a piece of bank that's more sandy, or more silty, then it will erode it faster. But over the years, what you lose on one side, you gain on another side. It's really not stoppable. As far as monetary-wise, you can't afford to do anything with it. (Segment I, Agriculturalist, 2006)

It's a good idea, everybody likes it, but who's going to stand the expense to put it in? We feel that it should be the Corps of Engineers because they seem to have the say so. (Segment I, Agriculturalist, 2006)

To try to combat erosion, it would basically be impossible. You don't have enough money. You don't have enough men and equipment to throw at it, at the time it needed to be thrown. If you ever looked at the old maps of the river and the meandering lines, it's amazing what this thing has done as far as moving where it wanted to go. (Segment I, Recreationalist, 2006)

We are so gung-ho on making sure we don't have soil erosion. We have to leave stubble on the field; we have to have a certain slope to the fields to prevent erosion. The biggest monster for soil erosion is the river. The reason they don't touch it is... [the] environmentalists and it is so costly. It takes a lot of money to riprap a river. We poop that away every day in Iraq.... We don't take care of our own country and our own people, just like this river. (Segment II, Agriculturalist, 2006)

The first estimate was about \$300,000.... The way it sets now, the only one that can turn the river is the railroad, or the government. (Segment II, Agriculturalist, 2006)

It is beyond us little people. The railroad tracks were about to wash in, and they ripped up there. The estimate was for \$800,000 and it ended up being \$1.2 million dollars. It is beyond us little people. (Segment I, Agriculturalist, 2006)

There are quite a few erosion problems that need to be addressed, but it's like anything else anymore. It's so expensive to try.... It's a pretty uphill battle when you start bucking Mother Nature. She's pretty much going to do what she wants to do, and if you try to alter her progress, it can get very expensive. (Segment II, Residentialist, 2006)

We've got the technology to do damn-near whatever we want to do; it's whether [or not] we can economically do it. (Segment III, Agriculturalist, 2006)

I remember reading in the paper, after the 500-year flood in Livingston, there was a guy that went ahead and saved some ground. I can't remember how many miles it was, but it costs him \$600,000. That's what he put into it.... He must have had a lot of money to invest, because it would take a long time to ever get it back. If it was for agriculture, I don't know if you ever would [regain that money]. (Segment IV, Agriculturalist, 2006)

About four years ago we moved the road.... Once [the river] decides to change course, it just keeps hammering on you until it wins. There are no cheap tricks.... One project we did with the Corps was to armor 500 feet of bank... The feds were kicking in 30 percent, and it still cost us \$170,000 to do those little, short pieces.... So, [with] a typical road, we relocate it. We're not talking paving, [but if] it's all gravel... probably, we can move a road for \$80,000 per mile. (Segment I, Civic Leader, 2006)

I've put a lot of money into riprap... three-eighths of a mile... [which is] half of my retirement fund.... I think it is almost cost prohibitive now.... I guess over the years I've put a \$100,000 to \$200,000 into it. That was when money was worth more than it is now. (Segment III, Agriculturalist, 2006)

I was told, 'We can't approve the using of concrete rubble.' I asked, 'Why not?' I have traveled quite a bit... and I have never been to a city on the Yellowstone where there hasn't been bank stabilization done with concrete rubble.... To do what he was proposing you could easily spend a million and a half dollars. You reach a point and ask, 'Is the land worth saving?' (Segment III, Agriculturalist, 2006)

I am not the expert, but I have lived here, and I have seen the river do some strange things. It may work for a few years if you do it right, but you could get a bad year, and it will wash it all out. (Segment I, Agriculturalist, 2006)

Had I substantial resources, there might have been things that could have been done.... [But] the scale is overwhelming.... To restructure an old jetty and riprap was three to five times the cost of the land.... I didn't have enough money because I had just bought the land. (Segment IV, Agriculturalist, 2006)

We have the permit and everything, but we didn't have the money to. [It] costs too much. (Segment IV, Agriculturalist, 2006)

I don't think [riprap] would be effective—not on a curve like that, because I think eventually it just...gets behind the riprap, [and] you end up doing it again. So, I don't believe riprap is the answer. (Segment III, Residentialist, 2006)

Cost and Durability—2012 and 2018

A lot of cases, it's cheaper to buy another farm than the cost of riprapping. (Segment II, Agriculturalist, 2012)

And riprap is a thing where if you put it in, you think well you're done. You're never done with riprap. You should have rock standing by so if some of it slips in, and it's a constant maintenance thing. Once you get it in, you got to constantly maintain it or you're going to lose it all... What's happening is like when the ice and that goes out on these dams, it's taking the rock away behind it, you know, and it'll cut... it takes that rock out. We just lose it down the river... and just dump more rock in. (Segment II, Agriculturalist, 2012)

In Forsyth down there, they had trouble with... the irrigation dam. And I went to that meeting, and... it got to be about where they were going to get the rock, it had to be natural rock. Everything has got to be green or natural... Well, the expense of freighting in this granite rock was just tremendous.... So, I made the suggestion to him, why don't you just haul a bunch of pit gravel in there, bring your bag of cement or whatever you're going to do, and set you up a cement plant right on the riverbank, and make your own rock.... And they thought that was just crazy. Well, that's the cheapest way you could ever possibly do it. (Segment II, Agriculturalist, 2012)

[And one man] just did a bunch of riprap and that high water took it all... he put a lot of money in it too... they'll only let you riprap like 300 feet, then you have to go get another permit. I think he wanted to go 700 and they stopped him. And I think where the old riprap was that held, but those weirs, they didn't work... I think it [riprap] is [effective]. It's really our only means right now, to protect, you know. But... they should have let him go further. They shouldn't have a limit on it. I mean, when you see with your naked eye where it ends, you know, it's going to cut him up. (Segment II, Agriculturalist, 2012)

I think I lost it [the barb] in this last one [flood]... they wash out, they roll... that cost \$25,000. (Segment V, Residentialist, 2012)

It's too expensive... it just doesn't work; you're trying to alter the nature of the river. (Segment IV, Agriculturalist, 2018)

Riprap is not very successful from my observation unless you're willing to maintain it with a lot of money and effort every other year... I think that the people that are doing the planning at the county levels probably need to be using it as much, especially in the

higher populated areas. Billings, Yellowstone County. And they may be using it some, I'm just not aware if they are. Most of the landowners along here are not going to put the money into riprap the banks. It's the high-dollar landowners that we've seen up towards Big Timber and some of that area where there's deep pockets and it doesn't matter what it costs, they don't want to lose a foot of soil, you know, along the bank. Even though they might be gaining it in some areas, too. That's unfortunate because I don't know what you do about it, because that keeps the river healthy, obviously, by moving, I understand that. But you have property rights that conflict with that, too, and some people don't understand that's part of the health. (Segment I, Residentialist, 2018)

I don't know how many acres you could say we lost down there. I bet it's 60 through the years... But back when our dad was alive, you could have ripped that, you know, you didn't have all the regulations like now. You could have riprapped it... He said, "I can buy a place for what it costs me to riprap... So maybe I'd be better off to just go somewhere else and buy another farm." But you can see the islands building down below from the high water, taking the soil. (Segment II, Agriculturalist, 2018)

A lot of these older ranches that are 100-year ranches, they're already doing that. They've been doing it forever. They already knew it was going to cost them way too much money to try and start riprapping or any of that kind of business. Let the river do what it, because it's going to do it anyway. You're going to get the right flood come down the river, and it's going to do whatever it wants to do. (Segment III, Agriculturalist, 2018)

The riprap would cost almost what the property and the house is worth. [Laughs] I mean, yeah, we couldn't afford to. And I don't know that I'd want to... If I knew it would definitely work and was affordable, I guess you could riprap and then fill it the riprap in with dirt so it doesn't look like a bunch of, you know, Rock of Gibraltar out there, but riprap ruins the entire length of the bank. Because, you know, I fish down there, there's little eddies and pools and stuff. You put riprap down there and you've got a slough way. That's what I've noticed with a lot of it... And it doesn't always work, it depends on the base where it's going to sit. Now it probably would work here. The only trouble is if it cuts up in front of it, it's going to be gone anyway... you'd have to go all the way upriver with it to stop it. It wouldn't do any good here... I'd be sitting here watch the rocks roll away. (Segment IV, Residentialist, 2018)

There is an intake down here... They have to, now—on a regular basis—get in there with an excavator and move the channel, under permit, in order to get the water back... but the river changes itself, it's got its own brain, it goes where it wants. I mean, it is costing them a lot of money to get that water back there. And... probably 6 years ago, that would have been 2012, the river moved so much gravel into the intake channel that it shut it completely down... The study they did on it, it was feasibly impossible to fix that channel. It was going to be a half-million dollars, and there was no such resources in your irrigation canal to cover a half-million dollar project. (Segment IV, Residentialist, 2018)

If riprap would work, but they frown on you using riprap anymore, and financially it's... the neighbor up there just up the river put in... I don't know, not a very long stretch to

kind of protect his house, because it's probably gonna take his house eventually, and it was \$36,000... [And] we redid that a number of years ago, put in a bunch of riprap. And that first winter the ice jam came in and cleaned the whole works out, so, you know. There's no way you can recoup that pasture on that ground... we'll never get the money back that we put into riprap that was gone in one year... So, we've just accepted the fact that the land is gonna go away. (Segment IV, Agriculturalist, 2018)

There was a riprap above there and the family that owns the property now kind of decided they don't know how much they want to fight with the regulatory authority. Plus, how much money. It's so expensive... it's almost cost prohibitive. (Segment V, Agriculturalist, 2018)

This year it's cutting the hell out of it up there by our pumps. It's really wanting to tear things up... the river makes a big bend and it's really sandy, so it just cuts the hell out of it... Someday... I'll never see it... my grandkids will never see it, but someday that river will be coming through here unless somebody ripraps it. And I don't think nobody will unless it's a billionaire.... I think it's something like \$40,000-50,000 a foot. Because we ain't got no rocks there. (Segment II, Agriculturalist, 2018)

But the ice, for riprap... you can riprap against high water, but you can't riprap against ice. When that ice comes in, in fact there's some of them box cars across the river in probably maybe a hundred yards from the water now. (Segment II, Agriculturalist, 2018)

It was right over, cracking the roadway when they finally got all the permits to do it. And they should have another hundred yards, but [laughs] they said, "This is as far as you can go." So, you know. (Segment V, Residentialist, 2018)

So, we have to be, you know, cognizant of their issues there, and maybe we need to allow for more bank stabilization methods there, and maybe the permitting process should be, you know, a little more relaxed for them or at least be more understanding of their situations. How do you know that? Because you live here and you hang out with those people, and they teach you things you didn't know. (Segment V, Recreationalist, 2018)

Especially in this part of the valley, it's tough. It's always migrating. And it's getting very hard to get permits to do any kind of riprap or any kind of bank stabilization. And that goes either way, I mean yeah, streambank preservation can cause problems down the river or to your neighbors, that's a huge question, but there are some things that need to be protected. And I'm not sure that it's always in the right place. If somebody's house is there, you can do whatever you want, but if it's your agricultural land that you're making a living, let it go where it wants to go. I don't know, I just think that their mindset isn't always in the right place. (Segment V, Agriculturalist, 2018)

Channel Migration and Easement Programs

I think at some point the government is going to have to be willing to step in and help the landowners along the river. That land has value, but it has value for many different

possibilities, not the least of which is wetlands. The floodplain is what lets the river spread out during these floods. I think that there is going to have to be some programs where the landowners get some compensation [if they] allow the river to go where it wants to.... And it has to be in the same context as if they are raising a crop. It has to be a long-term agreement [with] the landowner, be it a rancher or a farmer or someone who bought in for aesthetic purposes. They need to be compensated. I don't know any other way to do it. The local landowners...don't have the means or the money to just donate that. That is what they are being asked to do now. That isn't right. (Segment V, Civic Leader, 2006)

The mitigation fund should be acquiring some of these areas that have been ripped up in the past that need to be opened up for the river... [and] compensating people to allow the river to erode away their land... for their ability to live with the river in a way that's good for the river and the rest of us... Our best shot is to... try to figure out how to make it easier for landowners to face the reality that some of their land is going to be taken away, and that's where I see a mitigation fund and flood erosion easements being a tool we need to try to bring into place on the Yellowstone River... and it could be private; it doesn't have to be government. If people don't want government, there's different ways to do that. (Segment III, Recreationalist, 2012)

I hope it continues on the path that we're on right now. I think... we've got an awful good balance of... containment of the river where it needs contained, and letting it wander where it needs to wander... when you get out of the City of Billings and it heads east, we're seeing more people... putting their ground into these land trusts, where the water will be able to migrate whenever it wants to... they're called the channel migration easement. (Segment III, Agriculturalist, 2018)

Our neighbor leased her ground to, I thought it was to Fish and Game, and somebody told me it wasn't the Fish and Game. And she's letting it erode... The only thing is that she really, really devalued her farm when she did that... I guess I don't, I don't get it. And then she's created problems for us because now it's eating on her farm, but there's a farm we rent that it's gonna take it too. Because it's come in really deep on her, and now it's just washing away on my neighbor, or on my land that I'm renting... We protested it... but... you know it didn't matter. I think they just gave us some time to hear our complaints and it didn't matter, they were going to do it regardless of what we said. (Segment I, Agriculturalist, 2018)

We're actually talking to an outfitter right now about doing a river conservation easement... where we would say we're not going to do any bank-saving measures... [Because] we don't know what's going to happen in 100 years, but we won't be here, and somebody else will be. And the conservation easement... It's just a kind of a way to ensure that... whoever that next owner is, can't just do whatever they want... [And the benefit of that] it's mostly wildlife... [and to] help replicate what are more natural conditions and that helps establish the native plant base in those areas, that helps keep out things like knapweed, that helps keep out any of your noxious weeds that are spreading if you have a good healthy stand of native vegetation there... The wildlife are just healthier

and happier, so if we can do things to encourage that diversity of native vegetation, it works out well for us. (Segment III, Agriculturalist, 2018)

There's the out-of-state landowners that I have two minds about - the guys that buy the big ranches, the rich money people from back east and California, the techno financiers or whatever you call them, they buy the big places, but they also usually protect them. But they often cut everybody else off from using the things. (Segment III, Civic Leader, 2018)

My neighbor has done a lot to improve his property. He's a good conservationist. Of course, if I had a million dollars I could quite a lot too. (Segment IV, Agriculturalist, 2018).

Section 6. Dikes, Floodplains, and Development

Over the years, the towns of Glendive, Forsyth, Miles City, and Livingston have been faced with increased flood risks related to the conditions of the levees, locally called dikes, that protect these towns. Especially for the local Civic Leaders, problems concerning dike maintenance, integrity, and certification are high priorities. Restoring integrity is understood to be costly, as is flood insurance. Moreover, it is “hard to tell people what to do with their property.” Some residents have come to understand that when trees grow on dikes, they degrade dike integrity. The quotes demonstrate a progression from “Why can’t you leave the trees?” to a better understanding of the need to protect integrity. Yet, a persistent sense of security is expressed regarding local levees.

In each field season, civic leaders expressed strong opinions about the floodplain maps and regulations. Floodplain maps are controversial due to uncertainty. Several participants indicated they were “not sure” if they lived in a floodplain. Civic leaders were the mostly likely to discuss the maps as necessary and—when accurate—useful for the purposes of designing regulations. Some called for better maps. Framed as governmental interference with private property rights, some participants question why the maps change and why the rules seem to be getting stricter. Many were concerned about the security associated with dikes and levees under new regulations.

Since 2006, locals discussed the changes in their local landscapes throughout the valley. Participants reported that new landowners, many from out-of-state and apparently “wealthy,” were building homes and subdivisions closer to the river and on ridgelines. In 2006, these trends were mostly discussed by participants from the upriver Geographic Segments. By 2012 and 2018, those trends were discussed throughout the valley. Ironically, some of the “newcomers” were now concerned about too much development near the river. Some in the local communities were concerned how new residents would advocate for policies that impede local economic development. In 2012 and 2018, the changing landscape and changing notions about how to live with the river continued to generate a wealth of comments. Some thought maybe it was “too late” to control development.

Consistent themes dominated these discussions, including linking levee issues with local economic development, concerns about insurance expenses, private property rights, and governmental intervention. Many advocated a “builder beware” philosophy that would let people do as they wished, even if the potential for a bad outcome was likely. Others explained that the regulations were needed, and a “win-win” approach was doable.

In 2018, evidence of increasingly positive evaluations of relationship with the COE emerged. By 2012 and 2018, there was a growing understanding that regulations could not move forward as “one size fits all.” Also, in 2018, some conversations are quite specific to local projects and agendas. In Yellowstone County, there are local groups hoping to create a connected trail system to run along the riverfront. These projects are not universally supported among riverfront landowners. As the years passed and changes were noted, locals further understood a need for information and education concerning the river and how regulations could protect resources. By

2018, conservation easements were seen as a way to protect land from development, but the tax deductions were viewed as insufficient compensation and the program “too permanent.”

Dikes Protect Towns

Our Dikes are Our Number-One Priority—2006, 2012, and 2018

For the community of Glendive, solving our floodplain issue is our number one priority. (Segment I, Civic Leader, 2006)

The other issue that is of primary interest is the dike. (Segment II, Civic Leader, 2006)

Why can't you leave trees too? It can't hurt, and it's better than big chunks of cement. I didn't understand that. [The trees] were mostly dead, but still their root structure was still [there]. (Segment II, Residentialist, 2006)

The most important [issue with the river] of course, being the fact that we are still working on our floodplain issue and dike issue with the Corps of Engineers. (Segment I, Civic Leader, 2012)

Right now, one of the big issues is the dike has been deemed uncertified... [it's] the biggest concern that we have that's been brought to us (Segment II, Civic Leader, 2018)

[The] Corps of Engineers require us to keep the dike from being invaded by trees and shrubs so that its integrity isn't ruined.... They also want the dike clear [so that if] they have to get up on the dike...to work on it, they have a clear runway. (Segment II, Civic Leader, 2006)

And I know the city is also cleaning up the big trees down along the Tongue River anyway... because if a tree washes out, its root structure really weakens that levee. So, the city is working on it. (Segment II, Residentialist, 2012)

There is a tree issue on it where we keep it maintained... but on the inside of the dike, the river side that doesn't belong to the city... there is cottonwood trees... And they said we can't have any trees on it, but yet, there can be trees on the inside... It really doesn't make sense. (Segment II, Civic Leader, 2012)

If some of those huge cottonwood trees were to fall, tear out a hole in that dike in a year like this... it's going to destroy the integrity of our dike, and then we lose that. And then we, community members lose insurance coverage... Have you talked to Miles City yet? Been down there? ... Their dike, they lost certification and so I think their whole city is a floodplain. So, they have one heck of a problem with the insurance, and building, getting building permits. And so, we don't want to let that happen in Forsyth, so we have to maintain the integrity of that dike. So that's what we're working on right now. (Segment II, Civic Leader, 2018)

It's Hard to Tell People What to Do—2006, 2012, and 2018

The Army Corps holds the key to a lot of future development in Glendive. You might have noticed a dike that was built... back in the '50s to prevent high water and flooding on that side of the river.... Unfortunately... [they say we are] vulnerable to flooding and high water.... Because of our problem with the dike... they are allowing no building, no additions, no anything, on the west side of the river.... It is handicapping Glendive. (Segment I, Civic Leader, 2006)

The Army Corps of Engineers tells us that for all practical purposes we don't have a dike around this city, which has been protecting us for a long time, but they have eliminated practically all building over in the north side. They don't want to let us do nothing over there anymore... A friend of mine for example, built... a storage shed... and they wouldn't even let him keep that on his property. They said it had something to do with the footprint... I don't understand that ... the Army Corps of Engineers has intervened like in Glendive, they wouldn't let the McDonalds Restaurant remodel because they were in their flood zone, so they caused McDonalds to go out of business in Glendive. (Segment II, Residentialist, 2012)

I believe that if the city of Miles City continues on with the project and we get it certified, I think the real estate and the opportunities for improving the community would increase dramatically... So, I think that the main goal on getting the levee done would be to give the citizens of Miles City the opportunity to work and upgrade their residence and make real estate feasible again. (Segment II, Civic Leader, 2018)

When the Corps built the flood dike, they built it to the current standards, and it is not [now] acceptable as a 100-year flood dike.... To raise the dike, it would be ten or twelve million dollars.... To buy out the property, and demolish everything, and return everything back to the Yellowstone Basin, would be 18 million. You are talking to a community that doesn't have the money. (Segment I, Civic Leader, 2006)

Most of the north side of Miles City is in the 100-year flood zone. Everybody there is paying flood insurance. They would rather not. This is a town where the average income is a few hundred dollars over the federal poverty level. (Segment II, Civic Leader, 2006)

We have just been decertified from the government, you see, it is over the dike... [and] It means the insurances and so forth would go sky high because... this is not considered floodplain. (Segment II, Civic Leader, 2012)

We've had the issue with flood insurance and... people are not going to be able to afford to do anything with their homes. (Segment II, Civic Leader, 2018)

It is hard to tell people what to do with their property.... We, as a county, never were involved with the floodplain. We didn't want that restriction, [but] in 1998 the government forced floodplain administration on us. It came out of Congress: if you want

emergency funds for disasters, you will be in this program... they took the stance that said either control your systems on the floodplains or live without us. We had to get into it.... The commissioner's hands were tied. (Segment I, Civic Leader, 2006)

The Corps of Engineers pretty much controls all the water. So, they have a big hold over...us as far as what we can do in a floodplain.... They have really gotten strict. (Segment I, Civic Leader, 2006)

The Corps of Engineers [owns the dike] ... and... they flew in here with their corporate jet. (Segment II, Civic Leader, 2012)

That Army Corps of Engineers is pretty much dictating to the city what the city can approve of anymore... [and] I know [that's] the reason that [I] can't do nothing with it [my property]. (Segment II, Residentialist, 2012)

We have a beautiful relationship with state and federal authorities. But like the federal on the dike, they are really not using their head. You know, this has been here for, golly, probably 75 years... You know, for some reason they'll change policy, or some new person will come into the office and say we're going to change this. (Segment II, Civic Leader, 2012)

Look, if they think Livingston's going to flood, the Army Corps is going to come in and build an even bigger dike. They have authority over all of us, it seems like. I couldn't believe what they built in Livingston... They came and declared an emergency... They're ridiculous. (Segment V, Recreationalist, 2018)

The dike has been here for years and years and years and now all of a sudden, it's not good enough. (Segment II, Civic Leader, 2018)

The dike is kind of a funny thing because if you look at the east end of it, it makes a big curve and it just stops. If there...[were] an ice jam in the right place, it would just run through here. (Segment II, Civic Leader, 2006)

So, they feel that we are going to get flooded at any time. Which, God, in 70 years I have never seen water over my ankles. (Segment II, Residentialist, 2012)

All of that is in the hundred-year floodplain... [But I] never have [seen water back there] But my grandson, we gave him an acre back here, and... the County Planner told him that... because 18 feet of that acre lot was in the hundred-year floodplain, so he couldn't put a house there... I've been here 75 years, and I have never seen it ever [flood out], you know. And there have been some pretty bad floods... it never goes high enough to hurt anything. (Segment I, Residentialist, 2012)

Since I've been here there haven't been any issues [with the levee west of Glendive]. And from when it was put in many years ago, there hasn't really been any events that's caused any concern. (Segment I, Civic Leader, 2018)

I don't think the community worries about flooding. I think overall, they are very comfortable with the dike keeping the water on the other side. (Segment II, Residentialist, 2018)

The Interplay of Dikes and Flows—2006, 2012, and 2018

This I-94 bridge is the dumbest thing ever. When they built it, they made a place for ice to jam-up. There is no place for the water to go, and that dike is not up to specs... If the money was there [to fix the dike], it would be fine. Where are you going to come up with the 100 million dollars to do that? If they would have built that bridge high, all the way across so the water could flow freely, the dike would be high enough. (Segment I, Residentialist, 2006)

From the perspective of living here in Miles City [ask] 'How is that going to impact us?' With unbridled development, you could have a situation where the problems are prevented from occurring upstream, only to be exacerbated downstream. So, that's where we would have to take a look [and ask] 'Are we sufficiently protected with the dike system we have here, or are the neighbors here going to suffer because we are sending some of our problems downstream too?' (Segment II, Recreationalist, 2006)

If it wasn't for the financial reasons, I would rather not have the dike and let [the river] do its thing.... Had we never...[built] a dike, when the river got high, it would come and spread over the whole area.... You would have a bigger area, but not as much force...and there wouldn't be as much damage as with the dike.... I might be wrong, but I think that is what would happen.... [However], now it is financially impossible [not to have the dike]. (Segment II, Residentialist, 2006)

That initial... dike was stamped and approved and certified for a 100-year floodplain and, you know, was very adequate. And then when the federal government came through Montana with the interstate project... And for some reason, whether it be politics or poor judgment, they decided to cross the Yellowstone River here at Glendive... and because of that... the berm that they built leading up to the interstate on the north side of the river over there, took away the overflow channel that was a natural one for the Yellowstone River... and sure enough, they caused those problems and the Corps de-certified our dike and put all that land back in the floodplain... We feel, at least in Glendive, that, you know, the federal government caused our problem. (Segment I, Civic Leader, 2012)

Creating that levee... it just pushed and made it a problem further downstream. (Segment V, Civic Leader, 2018)

Personally, I would like to see this levee built. I would like to see it certified... [I understand] we're channeling and we're narrowing the channel of the river.... [We do it] for sake of the citizens, and the homeowners, and the population. We're not going to widen the channel of the river. (Segment II, Civic Leader, 2018)

Floodplains and Development

Mapping Floodplains and Regulating Development—2006

I am almost positive that we are not in the flood area. (Segment I, Residentialist, 2006)

At the very far end of River Road we had some flooding. There is what's called a floodplain, and the west end of town is part of the floodplain. But where we are, I believe, is out of the floodplain.... Like I said, my mom was born here...and lived here all but two years...and she said...the river has never come this far. (Segment II, Residentialist, 2006)

Basically, just the elevation [is the difference between floodway and floodplain], one's shallower. Um, the floodway in my thoughts is the deeper channels, it's like the river itself, and then the floodplain is like the surrounding land. (Segment II, Residentialist, 2012)

How the floodplain[s] themselves are delineated is just based on seat-of-the-pants [guesswork], basically. (Segment I, Civic Leader, 2006)

About two months ago, we had a big map that somebody gave us of the floodplain area....[The map has] the floodplain in the wrong area and it's costing a lot of people high insurance....And one fellow, he wanted to add a room on his house, and he [went to] get everything lined up, and he [was told] your insurance is going to double because you are in the floodplain. And his house sits way above the old shelf out there. Even if the Yellowtail [Dam] ever went out it wouldn't get to his house. (Segment II, Civic Leader, 2006)

There were some maps, but being a local, I understand this place floods, this place doesn't...So, even if it doesn't say so on the floodplain map, [sometimes I know it's] not a good place to build. (Segment II, Civic Leader, 2006)

Primarily, the problem is, [the maps] are so inaccurate. They are this blanket, 'Here is where we think it is.' I shouldn't say they are always inaccurate because sometimes we have information submitted in a site-specific area and they are right on. They don't take into consideration differences in topography. When they were done it was based on information that was from 1982. They couldn't go every 200 yards down the river. Since then, there is a lot more information. They are useful, but they could be more useful by being more site-specific. (Segment IV, Civic Leader, 2006)

The interesting thing is the Corps of Engineers, and the Montana State definitions of the floodplain, are different.... The boundaries...aren't the same.... We don't really know [when they will make the final determinations]. It is still pending. I would guess within the next two to four years.... Not having a floodplain [defined]...we have no idea what to expect from year to year, especially since we have been in a seven- to nine-year drought in this area. Water flows are much lower than normal, and we don't have the flows like

we used to have in the '70's and '80's. In '96 and '97 there were back-to-back flood years. That was a 100-year and a 500-year flood.... The biggest issue is the flood issue not being resolved. (Segment V, Civic Leader, 2006)

I have seen a major change in ownership along the river. We [now] have private landowners with a lot of money.... [They are] buying up large tracts of land.... Across the river we have a big shooting club. They have a big lodge over there, and they've tied up a lot of land that they own and lease. So, we've got different people now controlling what's going on, and the focus isn't farming; it's on recreation.... If your focus isn't being a rancher, you're going to lease it to somebody...maximize dollars, then get the heck out.... Well, that's state-wide. Everyone wants to get to the water.... Access is going to be a major problem. (Segment I, Civic Leader, 2006)

This area is fairly attractive to out-of-staters. They love the beauty of the area, and two of the key things they like are trees and water.... They want to be right down on the water's edge. They want to stand on the porch and cast that dry fly in the water. (Segment II, Civic Leader, 2006)

Everybody wants a little piece of land on the river, and then they build right on the river, which kind of sucks.... You go up by Livingston, and you see the houses. I mean, house, after house, after house, after house, built right on the river. (Segment IV, Recreationalist, 2006)

I think one of the things that we see more is encroachment of development in the river corridor.... Now you see a big house on the skyline instead of a natural habitat. (Segment V, Recreationalist, 2006)

Do you want me to come in and tell you what you can do with your 160 acres? And what if that is where you put all our resources...and your plan ultimately was to...pay for your retirement. Then along comes the government and says now we are going to make this a riparian area. This is a green space, and you can't develop that. I have just wiped out your assets. The government has to be careful that controls don't go overboard...[and] start infringing on private development rights. (Segment III, Civic Leader, 2006)

I feel strongly, if I'm in harm's way, it's my fault and I'll have to deal with it. If they want to pull my insurance that's fine. I have the means to survive somehow. But I think if you do live in harm's way, regardless of wherever you are, you have to be smart. (Segment V, Agriculturalist, 2006)

The people who have lived here, and grown up here, and have seen the Yellowstone at its worst— pushing those eight-foot-thick ice flows 100 yards from the riverbank—have a lot of respect for the river. You can go out here and see the stars and the trees. The locals know not to build there. The newcomers do not.... There's no understanding of the power of the Yellowstone or of the damage it can do. (Segment II, Civic Leader, 2006)

I always thought that any damn fool who wants to build on the riverbank, sticking his neck out, if he falls in—tough shit-ski. He should know better. It's like those guys in California that build up on a mudslide; they ought to know better. (Segment I, Residentialist, 2006)

I guess I'll stay here until the river comes up to the porch. (Segment III, Agriculturalist, 2006)

In ten years, I think [this area] will be fairly similar to the way it is today with a ten percent increase in the trophy homes.... Where I live, they are building a trophy home. Not me personally. I think [the construction of trophy homes] has created a lot of jobs for the community, so a lot of people will say this is great. It is allowing us to stay here and make a living, but there are a lot of people that resent it. (Segment III, Recreationalist, 2006)

As you travel the interstate, you can see people are within fifty feet of the bank of the Yellowstone. They can't get close enough—if it was up to them. Yeah, I do have a problem with that... From the planning board perspective, ... I guess I agree with setbacks.... Just, case by case. Someone has to make that judgment [as] part of generalizing to a rule.... [but] the river... varies every quarter [of a] mile.... No one could agree on how to word [the rule]. (Segment I, Civic Leader, 2006)

If we don't have regulations, we're going to have development right next to the river. I think development is the worse of the two evils, so we wind up accepting the regulation.... [Otherwise] we can lose the cultural resource.... [through] an incremental downhill slide. It's unfortunate, but this is America, [and] that's how it works. (Segment II, Civic Leader, 2006)

The planning board could adopt some zoning regulations that would describe which land-use possibilities would be along the Yellowstone, and it's probably something that's going to need to be looked at before long. Right now, we're kind of in the mode of not a lot of zoning because we don't want to put a lot of restrictions on the property.... We're thinking about how we want to proceed, but we haven't done anything because we want to make it so it's not restrictive. (Segment II, Civic Leader, 2006)

Most officials and residents are trying to maintain a corridor on both sides of the river, for the aesthetic value and free flowing. So, you really can't be building down on that floodplain. But we are getting very close.... [We try to maintain] a buffer zone to keep commercial and residential development from off the river. The river is a wild river and, if we can maintain a... 100-year floodplain without permanent structures or that kind of stuff, we are in good shape. (Segment III, Civic Leader, 2006)

This county does not have zoning at this point.... I'm not opposed to zoning, per se, if it's done properly. I think there's a lot of people here who are outright opposed to zoning, but I don't know if we're at the point where we need that. There are good things as a result of zoning.... I don't know if I would predict that for the next ten years, but there will come a

time when zoning will be needed, and people will be clamoring for it. So, I would say future generations will have it better in that regard. So, if you buy property in a certain area, you can kind of predict some stability. (Segment IV, Civic Leader, 2006)

People have wanted to put setbacks in place on the Yellowstone to keep development away from the Yellowstone River. I think they talked [about setback of] up to 300 feet, maybe, from the Yellowstone River. I think the setback now might be 100 feet. But that's one issue that has come up that people bristled-up a little bit over. I think the landowners themselves would probably be most content with no regulations, but people who float the river, maybe they want some regulation. (Segment V, Agriculturalist, 2006)

I would like to see a lot better mapping on the Yellowstone River. Most of our maps are 1982 FEMA maps. Some of the Yellowstone has had some updating, and...that is helpful, but there needs to be some better mapping and better understanding of activities in the floodplain, and how to best undertake those, both from a safety issue, and, also, trying to protect the resource. (Segment IV, Civic Leader, 2006)

It is important to have those floodplains and floodways delineated so that when the river is at high stages it doesn't do the tremendous amount of damage that it can. (Segment III, Civic Leader, 2006)

We maintain the floodplain maps here, [and] provide information to landowners as far as what property is in the floodplain.... We just got those new ones in the last five years.... I think they are accurate. (Segment II, Civic Leader, 2006)

Mapping Floodplains and Regulating Development—2012 and 2018

Looking back, ideally, I would have put setbacks in place in 1920, but it is hard to do it now... Madison or Choteau County... one of those had a 500-foot setback. So, it can be done. (Segment V, Civic Leader, 2012)

What we are seeing is people from back east buying the property as a hobby or not necessarily as a productive, they do... farm it a little bit, but they're not hiring hired men or whatever, so it's more of a hobby-type lifestyle thing. And... just for an example we have an astronaut that lives right here in the county that bought up five places that goes up Sarpy Creek. We had a developer come in and bought a big place and now subdividing that out, and some of the ranches that have consolidated. You just see fewer people running the same amount of land. So, there is no way to bring more people in that way. Unless we have some type of manufacturing thing, or something, happen here, Hysham won't grow. (Segment II, Recreationalist, 2012)

Nowhere have I been between Laurel and Billings... have I seen a section of land that doesn't have a quarter section that is being subdivided and developed. (Segment III, Civic Leader, 2012)

I would say [riverfront development] would be pretty good because it would bring in more revenue... But the problem... is that most of the riverfront is owned by ranchers. You know, ranching and farming and the way it is set up. (Segment III, Civic Leader, 2012)

Our area is changing very rapidly. It is becoming a recreation area. And the farms and ranches along the river are becoming, I probably shouldn't say this, "hobby farms" [laughs]. (Segment V, Agriculturalist, 2012)

Part of the land [is in the floodplain], I don't know. They're redoing it all. Some of it is floodway, some of it is floodplain... It [the difference between the two] depends, and they're allowing buildings to go on some of it, and I don't know which one it is now... I don't think anybody knows... Because you get a different opinion and a different saying from anybody, everybody along here. I don't think they know. (Segment V, Residentialist, 2012)

It's just something that our homesteaders years ago, if they built in a creek bottom and the creek come up and washed out their buildings or whatever, then they moved a little higher ground. And over a period of time, people when they come in, they build on a little higher ground. Well, we've gotten to where we don't build on higher ground anymore, and yet a flood can happen anywhere... we do not look at our history and history keeps repeating itself and we just don't think about that, and we need to. (Segment II, Civic Leader 2018)

A lot more people moving in... like near Sarpy they put in a subdivision... there's some guys from Whitehall, sold some land over there and got a pretty good price, so they come over here... and bought a section or two. And they must have had to pay pretty good, because they had it into 160-acre plots. Some people wanted it smaller, and they wouldn't do it—the commissioners. (Segment II, Agriculturalist, 2018)

Where we seem to run into issues, and we're going to see more of this... is out-of-state ownership. Um, wealthy people buying these places, and there's two ways this works. On one hand, wealthy people come in buy this, they start doing whatever they want to do, don't think have to answer to anybody. But on the flip side of it, when something does happen, they do have the money to correct it. Where your normal, everyday going-to-work Joe, can't. So, there's good and bad with that. But we're going to see more out-of-state influence on the Yellowstone River as time goes on. As land prices rise, land becomes harder to get a hold of, we're going to see more out-of-state money coming. Not saying it's a bad thing, I'm just saying it's coming... it'll be different. (Segment III, Agriculturalist, 2018)

We've got a little 100 acres. That's our little part of the river. We can do everything we can to make that great, but if you go to the southeast a little bit there are oil refineries on the river, and we have a coal plant on the river. You've got county commissioners looking at that coal plant site going, "We should do another industrial site there." You've got zoning permits being given out for storage facilities along the river. You go upstream

and you've got reinforced banks everywhere, so everybody can put their house there where it's going to flood anyway. See, you can carve out your little spot, and do the best you can, but when all this other stuff is happening. There's no resiliency there, there can't be. You're not giving anything a chance. You're not giving cottonwoods the chance to grow, when you're just looking at the fact that something has a railroad track to it, and we could probably use that for something better than a park, like what a sane city would do... Because for years, the community just looked at the river as a place to put their trash, and you know, site industrial facilities that need water next to you, farms that had animals that you need to wash the shit out of the barn just let it float down the river and that was all great. [Boise] went through some rough economic times and some city leaders actually sat down and said, "We should reimagine what we do with this river." And they built parks, they built interconnected networks of parks. They did a lot of work at reestablishing trees along the river, and native vegetation along the river. They turned it into someplace that people wanted to be. And then all of a sudden, things started to happen. You know, people wanted to come there to float the river, and so businesses popped up with ferrying people between their drop off point and where they come out. And then pretty soon people wanted to build restaurants close to there, and they wanted to build shops close to there, because people would do a float and then they'd come out and they would want to get something to eat. This whole chain happened. But it requires thinking differently. And that's just what I don't see happening around here. I mean I still, with our county and city leadership in Yellowstone County and Billings, I still think everybody looks at the river as some place to put their garbage... Instead of looking at it for the resource that it is. It really pisses me off in the end, when I think about it, because it's such a waste. You know? (Segment III, Agriculturalist, 2018)

Most of the people that were born and raised here know what that river does, and they stay away. (Segment V, Civic Leader, 2018)

Now, the only kind of potential this land has other than farming is if you find somebody... who has an awful lot of money and is looking for a place to park it. They'd like to own some property along the longest free flowing, wild river in the United States that has white-tail deer on it... turkeys... geese... ducks, and... all these wonderful things that people like that want to be able to say that they protect... And once or twice a year, they show up and they look at it, and they maybe hunt for a day or two, and then they disappear again. (Segment III, Agriculturalist, 2018)

I have seen a lot of change, through the last 50-60 years, and one of the biggest, biggest things I think impact is subdivisions. Because people buy the land and then subdivide it and sell it and bring in all kinds of people who want to change the world... they kind of like to have it their way. They don't want erosion; they don't want a lot of things to happen. "We are going to save our property, and we will build if we want to build a house over there" ... And then it's kind of fun 10 years later to drive by and say, "I told you so, you son of a gun." [Laughs] (Segment IV, Civic Leader, 2018)

Forever people worried about Bozeman, but Livingston and Park County wasn't growing. We've been 15,000-16,000 people for years, except for this last two years, and the impact

of Bozeman now is really hitting Livingston. And we have three or four subdivisions going in right now. There's not a lot for sale in Livingston; it's all being built on... the impacts and the costs of that growth... is tremendous... And that Yellowstone River is that damn thing that caused all these tourists to come here. So, you love it and you hate it, you know... Even with the valley, you know when I was a kid, you didn't even see a light on a house. There just wasn't that many houses up there, and now it's lights everywhere. It's like a little city up the valley. And so, you know, I'm not an engineer per se, to figure all that out, but I think it has to have an impact... So, I don't know. It always worries you. (Segment V, Civic Leader, 2018)

The worst thing that happened was the 20-acre subdivisions. That should have never happened. They should have been more thoughtful. Most people would... buy a lot to build a home on. They don't want 20 acres to pull weeds on, that kind of stuff. (Segment V, Residentialist, 2018)

Oh, gosh. Lots of changes. A lot of growth in housing, of course, a lot of subdivisions, new businesses. Last year we just got Sage Lodge built up here and then Mountain Sky Guest Ranch bought one of their neighboring ranches, and now they've done something with it... So, a lot of new owners of property in the valley, not just small tracts but large tracts also, ranches. (Segment V, Residentialist, 2018)

There's a lot of realtors that would love to take that 20 acres and split it into 40 pieces, and that's where everybody wants to live. (Segment V, Civic Leader, 2018)

I wish for a different circumstance for this ranch all the time. The river is not our friend, we live in the designated surveillance area, so we are highly regulated because of diseased wildlife, and we're surrounded by subdivisions. This is not a good place to ranch... [Some ranchers are selling.] One of the pieces [of land] they owned for years, just sold for 25 million. It was only on the market for a day. And rumors abound about what that guy is doing with it, but he's running gravel trucks in there like crazy, working on roads and I don't know if he's paving it. I don't know what he's doing, but it's really scary. (Segment V, Agriculturalist, 2018)

In our forty years since we've lived here... when you used to pull in the lane at night there were no yard lights in the whole valley. It was all ranches, there was nobody here but ranches. There was no one-acre plots, there was no ten-acre plots. Every parcel was at least 240 acres or larger and everybody was a rancher... the population of cattle in the valley was somewhere in the 10,000-12,000 range. It's about 2,000 now probably, the livestock in the valley. [And that's] Prices and subdivisions. I mean... if you bought if for agriculture is worth about \$300 an acre, probably \$400, if you were going to buy it and make it with livestock. It's whatever it is now, \$10,000-\$12,000 an acre... it's a shift. (Segment V, Agriculturalist, 2018)

We're in a high rent district, they're selling land in this valley for huge money... I wouldn't be surprised if they [future generations of ranchers] get forced out... Inheritance

tax on a ranch of this nature... There's no way... Unless you're pretty-well heeled, you won't survive (Segment V, Agriculturalist, 2018)

I think now we are starting to see more development in general in the valley... I think we're starting to realize that even locally in Livingston, and I've tried being supportive of this process at least with letters to the editor and some op-eds and that sort of thing, but Livingston doesn't have a good growth plan... the pass and the wind has always protected Livingston from too much encroachment from Bozeman. I think we've all realized those days are over; the pass and the wind are not going to be enough to keep them out. (Segment V, Recreationalist, 2018)

There have been several attempts at the legislature that have not been successful. The agreement is always, "One size just doesn't fit all." And so, if you say 300-foot setback or 100-foot setback on smaller streams, or try to define it one way or another, there are going to be people who object and then people who don't like government, so they will say that is heavy-handed. So... it is really hard to achieve. (Segment V, Recreationalist, 2012)

I'm really, really pleased that they are limiting the development that takes place in floodplains now. You know, because it's such an important, vital ecosystem... it carries life for not just people but so many species. So, in a very real and practical way too, it represents life. So, it needs to be protected. (Segment V, Residentialist, 2012)

You know, it's one of those quandaries that I get into. I hate the idea of somebody telling me what I can do with my own property, darn it. But at the same time when I see some of the things that people do with their... property, I'm just horrified. So, you don't want the control, yet you need the control. So, it's a hard one. Should we zone or not, you know? ... I guess at this point, if I were to come down on a side, it would be in favor of some regulation. Because even though individual property rights are vital.... You know, we're here such a short period of time, and then we're gone.... We can really wreck [things] for the generations after that by some stupid, selfish... decision we made. So, if I had to choose one over the other, I think I would choose regulations, but I almost cringe saying that. (Segment V, Agriculturalist, 2012)

We've got laws that you can't build within 100 yards of the Yellowstone which is great. Years ago, we let them build right up against it... You've got the people that have money that say, "Oh, I want to live along the river, and you can't stop me." But we had to pass laws even to say if you build in the floodplain, we are not going to sell you insurance. And I know one guy built in the floodplain, cost him a lot of money... and now he complains that every time the river goes up, he's being flooded. And we're saying, "We told you not to do that." ... So, yeah, there's more people... I hate to say... that's got the money, that that's their way of living. They think that they can do what they want to do. And we have to get... to be a little stronger. (Segment III, Civic Leader, 2018)

Even though there are some regulations about building in the floodplain, there's still considerable impact of homes that are near enough to the river that they create some

impact. So, adequate setback... Just trying to keep the floodplains available to the river to flood on is one of the best things. (Segment III, Recreationalist, 2018)

It was always a challenge because people fought us tooth and nail because the rules were set about setbacks and 100-year floodplain and that sort of thing. And, of course, if somebody has got 100,000 bucks in their pocket and they got to spend it and they don't want commissioners to get in the way. So, you are the bulldog of the bunch and always wrong... [But] It has worked out real well, I think. We have always had a good planning board and a good planner and good sanitarian people, you know. But how do you fight the old days? ... And some of it gets argued in too. You fight the system, terrible. But it is an interesting challenge politically. Very interesting. (Egan, IV, Civic Leader, 2018) There are groups out there that think they already have the big picture already in mind, and that's to eliminate all of the people along it [the river]. And we wouldn't even be sitting here talking about it if people hadn't have been along the river, would we? In a way they're right, but hey, this is the 21st Century. We're not talking 1793. (Segment IV, Civic Leader, 2018)

There are a few, a hand full of citizen-initiated zoning districts in Park County. Other than that, zone has been a 4-letter word, so it's very spotty, and not much acreage is regulated by any zoning in the county. And there are not any building codes in the county... The subdivision regulations are sort of what guides things, and there are setback requirements involved there and the sanitation requirements on where you can site a septic tank and what not. (Segment V, Civic Leader, 2018)

What worries me is people want to put bike paths and nature paths right through our property. And all of us bought this property because we wanted a little privacy. (Starr, 3, Res, 2018)

And of course, you have people within the City of Billings, we were approached once about, you know, they wanted to put in a bike path all the way down to the diversion dam. And they asked if we'd donate land and I said no. We don't want people. That brings people. (Michael, 3, Ag, 2018)

Calls for Education and Long-term Planning

You know, these conservation groups all on the river have been issuing permits for various activities and this kind of information provides a lot of knowledge to those people saying, "We don't want to put this structure in the river here or there. It's going to get wiped out," or whatever.... Education should go to the people that are doing the planning because they wouldn't even propose some of this stuff in the first place if they understood what the impacts might be or would be. That's the toughest part. (Segment I, Residentialist, 2018)

How do you deal with it? I don't know. I'm a firm believer that the government can't protect you from everything. You make too many regulations and all of a sudden it starts affecting something they didn't intend to. Personally, I would say a buyer beware type of philosophy... my opinion is that they should be made aware of the problem of flooding...

And if they do it anyway, shame on them... But here again is, you get too many regulations about it, you know. (Segment I, Residentialist, 2018)

We all recognize and value the river, and we all recognize the flood zone area. You're never going to put houses in there.... It's only going to be good for cattle grazing or horses, or something like that, and if you end up having horse trails through there, or bicycle paths, no big deal.... You could make out some kind of compromise so it could be a win-win for the farmers and ranchers and for the city people. (Segment III, Agriculturalist, 2006)

How we organize ourselves on the landscape is going to determine the health of our wildlife populations and also the demands on the river and perhaps river quality or fish and... I think there's some decisions that have to be made to try to figure out what this place should look like in 50, 100 years and how we see to it, because there is increasing pressure... [What] is it gonna look like if we do nothing? And... if we choose to do something? And nothing is always a choice... And it could be a conscious choice, or it could be a deliberate choice to try to get some consensus about hey, you know, how do we feel about setbacks? How do we feel about density? How do we feel about the current incentive system? It's interesting to contemplate, how do we decide how to organize ourselves on the landscape for that pesky greater good and to maintain the incredible geologic, geographic values that are so deep in our culture? (Segment V, Civic Leader, 2018)

Conservation Easements Protect the Land

With conservation easements I think that either people are afraid that the government is going to do something with the land, or they don't trust the people that are issuing the easement. But I think it is a good thing because it protects the land. (Segment III, Agriculturalist, 2006)

[Conservation easements] pretty much stop any development. I don't agree with conservation easements because it takes away the power of the future generations to make a decision...for no further subdivision. Some of them expand on that to no further development of any kind, either gravel or mineral or oil or gas or timber or feedlots. It just goes on and on.... [The people who set up conservation easements] ... have moved in from somewhere else, most of them. (Segment IV, Civic Leader, 2006)

Most [conservation easements] are done for the wrong reason. They are done for tax perks.... For [land worth] \$100 an acre, put a conservation easement on it, and all of a sudden, it's only worth \$50 an acre because it can't be subdivided. So, they take that \$50 as a tax write-off.... So, they buy land at a...cheaper [cost] than what you or I could because we pay \$100 an acre.... [For us,] it doesn't do any good because you're not in that high of a tax bracket where it's going to save you. (Segment IV, Civic Leader, 2006)

On this place, I love it here. And I would never do anything to hurt it. It is my job to be a good steward. And I don't need some conservation easement to encourage that. (Segment V, Agriculturalist, 2006)

I think that there is a lot of room for using market tools to solve conservation problems... I think [easement programs are] a good idea. I mean, it is a way of creating a property right that is transferable, with a transparent set of conditions, you know. They are open to transfer, purchase, and sale. (Segment V, Civic Leader, 2012)

Along the bank there is open water, cattails, and it's about 180 acres that we have that we put into a conversation wetlands project, an easement... And there are ducks and geese and all birds, pheasants, and it's just a beautiful area for bird wildlife... We did that because we wanted it to stay the way it was, hasn't been farmed for a long time and it probably would be some good hay acreage or whatever... we decided to put it into this wetland project... It's through the USDA program that they have... [And] It's lifetime, like 90 years, whatever, so yeah. They paid so much for the easement, and my father-in-law did the deal, and so we have been compensated for it. And it will always be that unless I guess some way you can buy it all back out, but not our intention, that's why we put it in there, so that's what it would stay for... So, the best way not to have anybody build and develop the other side of the farm was put it in the wetlands program... Along with the wildlife stuff. And let people use it like we've always wanted to do. (Segment II, Recreationalists, 2018)

No. No, I'm not going to tie my place up and devalue my ground to where my children don't have any options to do with it what they want to do. They want to do it, great. But I'm not going to put the hindrances on them. (Segment III, Agriculturalist, 2006)

I don't know. If it was just me and I was going to sell it, I would want to be able to get my money's worth. (Segment, III, Residentialist, 2018)

We did put a conservation easement on the property too which assures that it will be rural for the next bazillion years... It definitely limits [what we can do] ... and it costs a lot in the long term.... The tax benefits you get when you do it aren't anywhere near what you give up in value down the road. But we would do it again, I think... If you want to see your family stay on the property for ongoing generations, I would encourage you to do it... It's got to be a decision made by the family, not just one individual. My wife and I both agreed that it was a good idea.... Our son and our daughter live on the place, and we hope that they will be there for their entire lives as well. So... we're happy we did it... it's a five-hundred-acre chunk of ground that were it not for the conservation easement would be developed into small chunks of prime real estate. So, it's a good feeling to know that it will be five hundred acres of rural ground for eternity. And the river is something that we [included].... We gave up a lot of acres in the design of the project. And I think the design turned out really well as far as being wildlife-friendly, fishery-friendly... [but] our easement doesn't anything to do with the river; it just has to do with development. We can do anything on the river that's approved by the government agencies. (Segment III, Residentialist, 2018)

Half of our ranch is a conservation easement. Some of it was for inheritance tax purposes, trying to keep the land together and not having to sell it off to pay the taxes. And we want to conserve it. That's a tough question. A lot of people don't like conservation easements, we do... We're anti-building, we'd like to keep some of the open space... We're sort of unusual for ranchers. I think a lot of people think of their land as their retirement... And what's theirs is theirs... Nobody has the right to tell them what to do, but at the same time, if you just look around and see the way that land is being gobbled up... and developed... It's hard to see a house go up on virgin land when there's not very much of it left. It's really hard to see that. (Segment V, Agriculturalist, 2018)

I don't think it will change much, there's always somebody wanting to build a house, but we haven't sold anything. The lot of ours is under conservation easement, so it can't be... We did just, I don't know what it was, 200-300 acres here. Just, we had to get some money to settle the state, and they bought that easement. Then the rest of it my uncle did. He put his old place in conservation easement, then we inherited that, so we got a lot of conservation ground... there's quite a bit of it [around here]. Getting to be quite a bit of it... it's Montana Land Reliance... [And] there's quite a bit [of restrictions]. They limit how many houses you can have. You can't have a gravel pit or wind farm. No commercial timber harvests. Some of it is... Sometimes I wish we didn't have all that on some of that, so we could get some oil leases. (Segment V, Agriculturalist, 2018)

The fact that now you can do conservation easements... I mean think of that law... fundamentally saying yes, in perpetuity, you can make a decision... That's what we're trying to do, no question about it. But what we're not saying is, you know, the federal government is going to come in and tell you what to do. We're saying as neighbors we're doing things. (Segment V, Recreationalist, 2018)

Section 7. Intake and Other Dam Ideas

Discussion concerning diversions dams and water storage were common during all of the field seasons. In Segments I and II, the controversies associated with federal project to build a fish bypass around Intake irrigation diversion dam for the endangered Pallid sturgeon near Glendive were frequently discussed. In 2006, the controversy was relatively new, and reactions were quite visceral as farmers felt threatened by the push to secure passage for the endangered Pallid sturgeon and any associated uncertainties to irrigation and land use. Many in the area felt there was not a clear understanding of the importance of agricultural activities. Others wondered if the Paddlefish, popular with anglers, had been given enough attention. Many questioned the motives of “outsiders” involving themselves in local concerns. By 2012, concerns about shutting down irrigation had mostly faded due to the rebuilding of the Intake facility. By 2018, many felt a balanced, even “win-won” solution was in the making.

Interviews in Segments I and II also included discussions of Yellowtail Dam (completed 1967) and its impacts on the river downstream from the confluence with the Big Horn River. While communities acknowledged benefits of less-intense flooding, many discussed how regulated flows have changed the fishery. The dam produces electricity for some rural areas, and those participants involved in managing that service discussed balancing the needs of the river with the needs of those who are dependent on the power.

Many in the valley are attentive to the drought cycles. They often explained that while putting dams on the Yellowstone River had once seemed a somewhat viable option, in the 21st Century, the free-flowing river would generate resistance to any serious consideration of dams on the river. Participants wondered aloud how to store “Montana’s” water. Off-stream storage was discussed by some.

Intake and Pallid Sturgeons

A Big Controversy

The biggest problem here is the diversion dam. They are having a big controversy over the Pallid sturgeon. (Segment I, Residentialist, 2006)

Out here right now the big one [issue] is the pallid sturgeon. (Segment I, Recreationalist, 2006)

I think that’s probably the biggest concern I guess that I would have, the biggest overall concern. (Segment I, Agriculturalist, 2018)

Importance of Irrigated Agriculture

I think feeding the people of our country is the most important thing, and if we fail to do that, we will have a famine in our country. We will save the fish instead of the agriculture. Segment I, Civic Leader, 2006)

It's just like they're saying, "Well, we don't care what you do. You don't do nothing, nothing of importance. Just shut the goddamn river down, you don't need that." I mean it... I guess I'm a little offended on the personal side, you know, that somebody thinks that what I do for a living isn't important. To me it's important, but you know... little offended that way, that my business and my growing of food, you know... it's important, it's needed... Somebody always buys it so somebody must be using it. (Segment I, Agriculturalist, 2018)

The legal battles they are going through right now over that dam at Intake has got this whole community concerned. That is the lifeblood of Sidney, period. That's all there is to it... You're talking millions and millions of dollars' worth of economy for Sidney. And I say, my opinion, Sidney wouldn't last without it... because there's just no money in this country, no money for dryland farming. If you don't have the canal, you're back to dryland farming. It just cannot sustain. (Segment I, Residentialist, 2018)

I don't even want to start. I'll get upset here... It's the lifeblood though. If you took the irrigation away, probably sugar would go. The town would dry up. Sidney and Fairview, this whole valley didn't have a tree in it in 1906. It was barren, everything has been planted. All these trees you see along the river, they weren't here then. (Segment I, Rec. 2018)

I can tell you, the irrigated ground, there is 55,000 total acres being irrigated by... Lower Yellowstone Irrigation Project, all of that water comes out of the Intake diversion dam. And an acre of irrigated ground taxable value... was \$661, and... that is hay ground. I am guessing sugar beets must be a little bit higher because of their value... [and] one dry land, just regular hay ground is worth \$100, 105 I believe it was. One ground of dry land pasture is \$14. So, what would happen to your tax base, because there is 36,000 acres, I have been told, in Richland County that the taxable value would go from \$600 immediately to at least \$105, \$115 maybe. (Segment I, Civic Leader, 2018)

Is the Pallid Problem Over-Blown?

Now, some things are supposed to go extinct if they can't make it... I don't think that will hurt anything. [You] can't save everything. (Segment I, Agriculturalist, 2006)

Those kinds of things become extinct all the time. They have forever, always will, and it just so happens these sturgeon survived longer than some of them. They're a prehistoric animal, that old sturgeon, and maybe [their] time has just run out. (Segment I, Agriculturalist, 2006)

You have to wonder about the Pallid sturgeon. You kind of wonder if that is as serious as they say it is. (Segment I, Agriculturalist, 2006)

Did you know we're killing 80 million fish a year in this canal? ... God, wouldn't you think it would stink around here? It's not that bad. I don't know where these people come up with these numbers. (Segment I, Agriculturalist, 2006)

It seems like they have gotten a little too much emphasis on the endangered species part. I don't want the Pallid sturgeon to disappear, but I don't know how much money we can spend on it. I don't know that they can do a whole lot about it. I don't feel that they should let other fisheries go because they want to spend so much time on the endangered species. (Segment I, Recreationalist, 2006)

The changes they're going to make, like I said, spend millions of dollars...they could haul them in a limousine...you know, what I'm saying? It's just crazy. It's ridiculous, and with the amount they're talking, you could give each one a limousine ride up there every day for a long time. (Segment I, Agriculturalist, 2006)

Most of the local people feel that why are we spending 20 million dollars on extending their breeding ground when 20 million dollars could do so much for our community... So that's probably the only conflict there. I believe that the fishermen and, you know, people that live in Montana wouldn't disagree with saving the pallid sturgeon if that's the last step... But at the same time, from an economic standpoint... local residents have expressed some concern over that cost versus the cost of, you know, getting Glendive, Miles City, and Forsyth whole as far as land that we can use. (Segment I, Civic Leader, 2012)

The pallid sturgeon... with a lot of these bridges... if you put in another couple spans... then you're probably up another hundred thousand dollars... so what they do, is they'll make it abrupt and they'll narrow up the river with the bridge, like these highway bridges. Well, anytime you narrow it, you restrict the water, and you get an effect. So, it speeds up the water... so the pallid sturgeon, the way I understood, can only swim up a stream 3 to 4 miles an hour. But right here where these bridges are, they'll speed it up maybe to like 5 or 6. So the sturgeon wasn't going to make it through these bridges... So, there's a bigger problem and bigger issue in the middle with the state highways. (Segment II, Agriculturalist, 2012)

I don't want to see a species die out, but I don't think they're dying out anyway. I mean there's two schools of thought on that. There's plenty of them, they planted some. They said they don't breed in captivity, but they planted some so how did they get them? So, they must breed in captivity. (Segment I, Agriculturalist, 2018)

I think there are more of them, and they keep saying every year, "125 are left." ... There is more than that. But they really are a fish of concern. (Segment I, Recreationalist, 2018)

They had that big controversy at Intake about... the pallid sturgeon won't reproduce because of that dam. We've caught pallid sturgeon this big, and you go to show it to a biologist, and they turn around because they don't want to see it because it doesn't fit their agenda. So, I don't have a lot of respect for them. (Segment I, Recreationalist, 2018)

Somebody made this statement that we lose 800,000 fish a year. Really? It would stink so bad in the city and Montana of dead fish if there was 800,000 fish dying. I mean, come on. I think they swim right out the end of the canal back into the river, they just took a different route to get downstream... So, we're not losing 800,000 fish. I swear to God, we weren't. (Segment I, Agriculturalist, 2018)

I'm a strong believer in protecting the wildlife. You can tell from our conversation that I love the wildlife, but you can only do so much, then all of a sudden, you're hurting another species on this planet... [And] you have to be considerate also of the people, and we're part of this earth and planet also. If you start making rulings to affect one fish out here that maybe impacted one half of 1%, all of a sudden you start impacting tens of thousands of people, that's not alright (Segment I, Residentialist, 2018)

Questioning Motives

I guess there's talk that they'd like to have the diversion dam out, just so people can boat over, or canoe over it, or whatever... Which would [mean we will have to] pump the water... Well, most of the guys who want to do that are environmentalists... They're really deep thinkers... the electricity... It would take burning coal, or something, to make it. (Segment I, Agriculturalist, 2006)

Tell me if this is true, do they get their lawyers for free? This is what I've heard. That the Friends of... Defenders of Wildlife get their lawyers free. The government pays them up to \$600 an hour per lawyer... I think if you dig into that, you might find out. That would be a question I would like somebody to answer for me, because I think that's totally unfair that the government pays for their lawyers, and I got to pay for my own... But they don't realize the jobs and the chaos they're creating to real people... I mean if somebody comes up and asks me, "Do you want to kill wildlife?" No, I don't want to, but I mean... I think we've come up with a plan, but they don't like the plan, so therefore they just keep fighting it... I believe the Corps and the Fish and Game are on the right track. I think they actually want to help the fish. This other party, I don't think they care about the fish, I think it's just about getting the river open... if they really cared about the fish, let's get this thing built instead of fighting about it (Segment I, Agriculturalist, 2018)

In my opinion, they are domestic terrorists... the Defenders of Wildlife, they are no more concerned about saving the fish, they just want to make this an open river so they can float it, which is absolutely nonsense... Then they say, "Oh, it's about saving the fish." There would be more fish sucked into them pumps every day than there is total all year long what we get off of that... So, it isn't about saving the sturgeon, it's about shutting us down... Ask yourself why the Defenders of Wildlife are even in this fight. Whatever happens, if we get our bypass and keep our weir or lose it, it's not going to affect them one iota, not one. Because it isn't their livelihood. So why are they even in the fight? (Segment I, Civic Leader, 2018)

Aren't Paddlefish Important?

The Intake Diversion Dam...keeps the paddlefish from going too far upstream. Our paddlefish season is very productive. They have now limited it to 1000 fish caught, or six weeks. The last two years, the season has lasted seven days and ten days. That is because they can go down to the dam, and snag them, and haul them out. (Segment I, Civic Leader, 2006)

There's a push to get rid of the Intake Dam... this is to aid the paddlefish in getting up stream, which I think the dams been here since 1905, and paddlefish seem to be thriving. (Segment I, Agriculturalist, 2006)

What bothers me is that, okay, we're doing this to save the pallid sturgeon but now the existing plans we have is not just affecting those fish but it's affecting every other species on the river including the paddlefish which aren't doing that great right now. So that's what I don't like. (Segment I, Residentialist, 2018)

There's No Reason They Can't Fix Intake

From my understanding... you can keep the dam, keep the irrigation, and the canal the way it is, but the fish need to have an alternate route to get over the dam. (Segment I, Recreationalist, 2006)

There's a push to get rid of the Intake Dam, which is not really a dam... and that would be impossible because those farmers can't afford to pay for a pumping project when this is gravity flow. (Segment I, Agriculturalist, 2006)

There's no reason why they can't fix Intake Dam. It's got to take somebody that's got heart who wants to put heart and soul into it. That isn't just a job for an agency person. It's got to take people that are on the land that are willing to go above and beyond the call to get involved. And then put credibility into it—not that agencies don't have credibility, not that they don't have good people. But there's that division of the 'us and them,' mentality. And the us have to become them to make it really truly work. And then it drags; it's that black hole effect. It drags a whole bunch of other folks into it. (Segment I, Agriculturalist, 2006)

The rest of the thing is still up in the air, and they ran out of money to do it, so I don't know. (Segment I, Recreationalist)

Phase 1 is they built new intake canals... and they put screens over the new intake portions... hopefully keeping fish from entering the irrigation canals, etcetera... The new massive structure they have down there is super... but now they are awaiting funding and/or an okay to go ahead with Phase 2, which would be to build a ramp, a bypass ramp, around the dam so the pallid sturgeon can get further upriver to spawn and have a longer spawning area in the Yellowstone... When the Corps is going to move ahead with Phase 2

is anybody's guess with the present congressional funding situation. (Segment I, Civic Leader, 2006)

The irrigation project... I would never recommend that that dam be taken out. If they are feeling like some fishes aren't going where it wants to go, I'm sure they could make an arrangement. (Segment II, Agriculturalist, 2018)

I guess I would like to see this intake issue settled. But I don't think... it'll ever settle. Unless they get their way... If we get the weir in, I think there will just be another issue... we need to get this thing settled... We've spent a lot of money on lawyers. (Segment I, Agriculturalist, 2018)

What I do notice though, is we use some pipe, and if carp would get in there it was a problem. I don't have that problem anymore, so the fish screen wasn't that bad. It wasn't that bad of an idea. And I think they kind of... whoever engineered it actually did a pretty good job... I think it's easier for us to control the water going into to the canal now with that system, so I don't look at that as all bad. (Segment, I, Agriculturalist, 2018)

I mean we want the fish to live, but we also need the people to live... It just would not work to try to pump the water for that big of an area. It's just phenomenal the costs (Segment, I, Agriculturalist, 2018)

In my opinion, it's negatively impacted the river since they put the new inlet structure in... just for fish movement... There's not a lot of green people around here, and I don't consider myself green, I just don't like the way this has played out. We got, the Corps kind of led everybody down a path and then they switched paths, and all of a sudden, there's people that are upset about it. (Segment I, Residentialist, 2018)

I know, if you're an irrigator, obviously you want your water, number one, and you want it cheap, number two. And I can understand that, but at what point do the taxpayers have to provide, what share of that should the taxpayers, you know, take on, and what the responsibility for you guys? Because their water's been really cheap compared to everybody else's... they're sensationalizing some of that, saying if we don't get this, you know, 55,000 acres will no longer be irrigated and it's going to be devastating and all this... most of the people around here don't talk about it too much because if you're negative, you're against farming. You know, and I'm totally not against that, and it's never been an argument about water or no water, it's just whose share, who needs to bear the burden here, or partial burden... I don't know where it's going to end up. I totally understand their interests in what they're doing, but at the same time, I see both sides too (Segment I, Residentialist, 2018)

Yellowtail Dam

Benefits and Harms of Yellowtail Dam

We used to get ice jams. We haven't had ice jams for years. I think that has a lot to do with Yellowtail Dam, too. I think that warm water coming out of Yellowtail Dam has kept the ice from getting too thick. (Segment II, Agriculturalist, 2006)

Before they put Yellowtail Dam in, you had a lot more ice. It was thicker and bigger... With the warmer water from Yellowtail, we don't have the bigger ice flows and the thicker freezing of the river. It is a two-edged sword because that part is good for winter. (Segment II, Agriculturalist, 2006)

Since they put that dam in, that water is a little bit warmer as it comes out of there, and the ice isn't near the problem that it used to be like back in the 60s. (Segment I, Civic Leader, 2018)

Since Yellowtail has been in... I think we've had a lot less erosion. Yellowtail is controlling the spring runoff. (Segment I, Agriculturalist, 2006)

I really think that since '96 they've done a lot better job.... They had to because [before] they weren't doing their job.... They were slipping up.... And they've been doing a lot better job. (Segment II, Agriculturalist, 2006)

The fishing has just improved over the last probably 10 years tremendously for some different species of fish... I think the water quality is really good... the water is a lot nicer coming out of the Big Horn Dam, or Big Horn Lake out of Yellowtail Dam. It keeps the river pretty consistent here, and that way we don't have the really low water or the really high water, except the spring runoff. And I think that consistency has given the fish the opportunity to reproduce and survive there. (Segment II, Recreationalist, 2012)

Controlling the flow of the Bighorn last year was a big deal... for downstream flood relief. (Segment IV, Recreationalist, 2012)

I think they open the gates at the wrong time... during the high-water mark, which half of May, and all of June. And that adds to the flooding that takes place along the river. And, of course, the guys...that have river land continue to lose it because of the high-water washing action... It's a major disaster when it happens. (Segment I, Agriculturalist, 2006)

There have been several battles about how they regulate the water in Yellowtail [Dam]. Sometimes, when there is a lot of runoff, they will dump water and it will cause excessive flooding down here. It is well documented that this is an ongoing thing. The state and the Feds don't agree on this process. We have had several go-rounds on this. (Segment II, Agriculturalist, 2006)

It's nice to have it [the Yellowstone] that way [free flowing]. Because if you did dam it off, it creates problems. It controls the flow like it does on the Big Horn, but then you have got moss. When you have clean water and sunshine you have moss and lots of it... And it really creates headaches for irrigators... They have a moss ditch at Hardin, and

sometimes it is manned 24-hours a day for the water going into the canal. That's how bad it can get. (Segment III, Agriculturalist, 2012)

I don't think we're getting the flood control that we should be getting from Yellowtail Dam, Boysen Dam, and the Cody Dam... I think that they're not letting out enough water on these dams to compensate for these floods that we've been getting... And so now half of our place down here is going down the river. And I'm not the only one... And they talk about soil conservation, well, it's a farce because there's so much water intake and so much erosion on this river... But I talked to a federal judge about it, and he said... what you need to do is... have all the ranchers file a class action lawsuit... And see, one of the things is, when they put the dam in, the dam was supposed to be for recreation, irrigation, and flood control... Well, maybe they are doing some flood control, but... with all the technology and satellites they ought to be able to tell what the snow depth is... somebody is not doing their math right... But... you can't blame Yellowtail because they've got two Wyoming dams sitting up there, and when they get full, what do they do? Dump it down on Montana. So, you need to have the congressmen and senators, I think, working together. And they're going to tell you they already are, but I think that's bullshit because it's not happening... So that's my opinion; I don't think it's regulated right... To me we're not being represented... They don't care about the ranchers in my opinion... But you know... if you live along the river you have to expect high water. But you know, we have so much technology, why can't we do a better job than what we're doing? That's what I'm saying. (Segment II, Agriculturalist, 2018)

Balance Interests and Work on Communications

There were a lot of issues on Yellowtail Dam, [including]... how high you let the water come up in the spring, or how low you take it If there's a lot of snow way up above, shouldn't the Yellowtail Dam be taken down a little bit more to help hold that back? On the other hand, it provides a great source of irrigation... late in the summer.... So, it's a tough issue to balance.... I believe... the Corps of Engineers... came down and had some town meetings afterwards, to take the heat, I guess, or to try to explain how they have to balance all these different uses. (Segment II, Residentialist, 2006)

The Army Corps of Engineers controls it, I think.... They did [notify us] for a few years right after that flood, and then they quit again.... Well, now that's the biggest problem. (Segment II, Agriculturalist, 2006)

It would be nice if they would put information out. (Segment II, Agriculturalist, 2006)

There is no [communication] that I know of. We have tried... mostly through the Conservation District... but it didn't seem like we got much response.... I would pay a little more attention to what is going on downstream instead of just the dam. You have to look at the whole area more than they do. (Segment II, Residentialist, 2006)

I think the toughest thing is when you are using the Yellowtail Dam to help control water, and they have issues of how high they need the dam to be at Memorial Day for boating

up there, versus holding back water so we're not flooding. Of course, the preference down here is you let the water out so you can hold it back this time of year and not let the river get so high. But there are recreationists up there that need the water a little higher so they can access it, so it's just a tough thing that the Corps has to deal with on there. (Segment II, Residentialist, 2018)

Water Storage

Dam the Yellowstone?

My biggest concern is...[a] dam. It's a wild river. It needs to stay a wild river because it's one of the last ones.... If there were wild rivers across the United States, then it would be no big deal. But when this is one of the last, if not the last, then that's different. If it is the last, then we need to keep it just because it is the last.... That is my biggest concern. (Segment I, Recreationalist, 2006)

I don't think that the river should be dammed... Most of the damming we have done hasn't helped. We dammed up the Colorado so we could irrigate California and they paved it over and built houses. I am opposed to a dam. (Segment III, Recreationalist, 2006)

I hope it continues to be the same. I can't imagine that they're going to dam it because it is the last major, longest free flowing river in the United States. Hopefully, they are not going to impede the way it works its magic around here. (Segment III, Recreationalist, 2006)

As long as it stays natural, that's the best. No dams, no changes. Just leave it...like it is today.... I like to watch the river come up in the spring and go back to normal. And just, you know, wait for [William] Clark to come down. (Segment IV, Residentialist, 2006)

Ideally, I would like to see a dam on it, but I think we've passed that opportunity. At one time, there was quite a bit of engineering done; they were going to put a dam above Livingston. Now they've developed housing so much along the Yellowstone that it probably won't happen. (Segment II, Agriculturalist, 2006)

I, myself, believe that [by] putting in a dam on the river...they create a controlled way to keep flooding from happening and a controlled river-flow downstream. At the same time, they make better use of the resource through recreation, or irrigation projects, or power, or whatever. I think you can physically do things to a river...for the betterment. A perfect example is the fact that they built the dike, here, sixty years ago to try and make the community better. (Segment I, Civic Leader, 2006)

[In order to have a lot more water] you'd have to build a dam up in...Paradise Valley or somewhere up in there. And that is such a beautiful area, you'd hate to see that lost.... I'd have a lot of misgivings in this day and time. At one time, I was real-strong in favor of it. I think it is important for future generations. You know, I suppose that's as important as

the land we irrigate now, [but] we already can overproduce what we sell. So, it's hard to say. (Segment II, Agriculturalist, 2006)

I think it is too bad we can't divert it somehow, the high water, and put it to use. Once it leaves this state, it is gone. I think we could develop more agriculture if we had some diversion. I'm not sure how'd you do it. Maybe it would take a dam and that would be pretty hard to do anymore. (Segment III, Agriculturalist, 2006)

Another conflict would be between power generation and wanting to use more of the water for power generation and also for cities...and agricultural diversion dams.... It's not too much of an issue right now, but in ten years..., I think it might be. I think there will be conflicts of development versus leaving the river in its pristine character. (Segment III, Recreationalist, 2006)

The river corridor is like the whole valley. In places, the Yellowstone River valley is miles wide. The river is actually maybe 600 to 700 feet wide, but there's from hills to bluffs on both sides; it's pretty extensive.... You have to be careful, I think, so wherever little creeks that drain into it, and we need to be careful not to impede those.... There's things that could be done towards the outskirts of the corridor that are definitely going to affect the river. (Segment III, Civic Leader, 2006)

It is the longest free flowing river in the United States, and it should be maintained as that. (Segment V, Recreationalist, 2006)

I just want people to love the river and to respect it and not do anything to damage the way it does... How do we protect that river? You know, not use too much water, not riprap too much... Don't put a dam on it. I mean I lived through... Froze to Death Creek that comes down, one time they wanted to put a dam there. They were going to give this fellow who we knew the family all this money, and I'll tell you what, there was kind of an uproar in the community over that. No, my folks, no, do not dam the river...

Interviewer: Let's say somebody listens to this in 50 years or 100 years, what would you want them to know coming from history about right now? ... How good we've got it. And it is god's country. And don't dam the river! ... Whichever way you want to put it that way, don't put a dam on it and then don't 'damn it' the other way either [laughs]. (Segment II, Recreationalist, 2018)

Mother Nature wanted it that way... Once we keep it free flowing and going... We should be doing good. (Segment III, Civic Leader, 2018)

Dams or reservoirs seem to be appealing recreationally, but they sure change the nature of the riparian areas and the fishery. So, I hope that those things would be held off or just not done right on the river. (Segment III, Recreationalist, 2018)

Just don't stop the river. Don't put a dam. It's pretty neat. (Segment IV, Residentialist, 2018)

Big Horn's set up a lot of people... as far as producing energy... [But] the Yellowstone has been declared the last wild river in the United States, so people don't want to do anything to it. They already don't want any unnatural diversion, however... You've already got people along the river that have done things to change its course already... but I kind of think that in years to come they are going to have to do things a little different, just to make things work... I know there is good and bad about dams, but I always thought it was, in my mind, a good thing, but that's why this is a free country. People can have their own opinion. (Segment III, Agriculturalist, 2018)

If you can store water, that's the ticket... I know you can't make it rain, and you can't dam that river, you can't. It shouldn't be. (Segment III, Recreationalist, 2018)

I come back with the statement which bans me forever against every environmentalist that there is. And I think there should be responsible control of the river. I understand free flowing, dam-free. I was born and raised here... But every time I look at what happened in 2011, and I see the amount of water that we flushed down that could have been used for irrigation, for all sorts of things that could bring back some health to our agriculture... Water is used for man, it is put here so man can use water responsibly... Does that mean that I would advise a dam? It should be in the discussion... If it's not in the discussion, you're never going to be able to address the issue. You've got to be able to stand for it and bring the topic up. (Segment III, Civic Leader, 2018)

The biggest thing is if we had a dam and that would store the water and you wouldn't have these terrible floods and we wouldn't be talking about the river... Not going to happen in our area because of the fact that they are taking them out instead of putting them in... But you know what else it does? Look at Oklahoma. Oklahoma in the Dust Bowl days... they started building reservoirs. If you look at Oklahoma from the sky, it is all reservoirs. What did that do? It changed the climate in Oklahoma. Now they get more moisture than they ever did in pre-Dust Bowl days. I don't know why it is such a bad thing. You can't even hardly get a permit to go on your own property and go build a pawn. Makes no sense... They say it's all for the fish, but where is the best fishing? Around any dam. It's always the best fishing... Helping the economy... so it's bigger than just natural, I think. (Segment IV, Civic Leader, 2018)

It's the only undammed river, which I think years ago... you'd never get it done now. Years ago, if it was dammed, slowed down, and controlled a little bit... (Segment IV, Agriculturalist, 2018)

Off-Stream Storage

I think there will always be plenty of water in the Yellowstone until late in the fall. There will be some shortages that show up in the fall, for irrigation mainly. The river gets so low then that people have to pump and that is expensive. I don't think they will ever put a dam on the Yellowstone. I think there is too much public pressure. The only thing is, if they could divert some of the high water, and use it when the river is low. I don't know anybody that is in favor of a dam. (Segment III, Agriculturalist, 2006)

I wouldn't mind some water being diverted off into a big reservoir, so we can store water. That'd be nice...and I always thought we should try to hang onto as much water as they'll allow us to, instead of just letting it flow into the ocean, because we need it here. We live in a semi-arid desert. And sometimes the river gets so low, we're losing out on species of fish that need water to live in...[and] when the water table goes down there's certain types of trees that can't make it, too. (Segment II, Residentialist, 2006)

I think there could be some more improvement. Somebody had this idea of storing that water when the river is really high and then letting it back in later. I think that should be done. (Segment III, Agriculturalist, 2012)

Well, you got to start with the beginning, when there is lots of water, do what you can to conserve it, store it. One of the things on... the [Yellowstone Basin] Advisory Council, that we talked about was, how do you creatively store water? Off-stream storage. (Segment III, Civic Leader, 2018)

It's [water storage is] a good thing to look up and research, because there's been discussion of a way of recharging by doing a reservoir there and taking the water, putting it up there, hanging onto it, recharging or pulling it out of there. (Segment III, Civic Leader, 2018)

We're involved in a project right now that has identified a significant area to create a water reserve that would run the City water right through BBWA canal into a very large reservoir. That would allow us to bank, so to speak, eight to nine months' worth of water and provide a secondary source for the community. So, it's a big deal in terms of just protecting future growth for our community, but also just the existing population that we have. The other opportunity that it potentially offers is the distribution of raw water to the suburban and urban areas in Billings so we're not using treated water for unnecessary use like irrigating a lawn or your garden.... The foresight that our leaders have here in Billings I think is profound... Dave Mumford who's the Public Works director here, and who I feel is an understated visionary for our community, as a public servant.... [His idea] is part of the integrated water plan... [And] they're hoping for five [years until completion].... It's exceptionally aggressive. The hold-ups... may come with DEQ, getting the appropriate permits on something like this that's so unconventional, but I think that discussion has already happened. So, I think that there is some real possibility that this could be happening sooner rather than later... The left side of the aisle and the right side of the aisle, the recreationists and the fundamentalists, they were all just like, "Yeah, keep going. We got to do this. This is a cool project for Billings." (Segment III, Residentialist, 2018)

I want you to build a big dam off the Yellowstone River somewhere so that it don't do all this damage and we can use that water later. People hate me when I say that [laughs] ... The trouble with me saying that is because we know everybody; we were crop adjusters for years and years, so we traveled the whole state, and we know everybody. There's just no place I can think that they can do that where they wouldn't do it on somebody. You

know what I mean, take somebody's property. So, I should have bit my tongue. (Segment II, Agriculturalist, 2018)

Section 8. Riparian Areas and Cottonwood Forests

In designing the original protocol, efforts were made to engage the participants in conversations regarding riparian areas, however it was assumed that the term was not a locally used vernacular term. We attempted to elicit comments that might answer these questions: Was “riparian” a term local residents would introduce into the conversation? What do participants use to express understandings of riparian areas? Moreover, did they attach any value to riparian areas?

To avoid using the term riparian, we decided to solicit conversations about the “river corridor.” The results were not always successful in terms of soliciting discussions about riparian areas. Indeed, for some, the term “corridor” had political connotations. Participants worried about how wide the corridor boundaries might be: A quarter of a mile? Five miles? They offered opposing opinions concerning whether or not restricting activities in the corridor was a good idea. By 2018, the conversations concerning corridors were much the same, however a few people described the corridor as an interface, or as an expanse where the river could migrate.

In 2006, discussions that could be categorized as fitting a riparian theme were obvious, and some participants introduced the term into their explanations. There was much attention to wildlife, birds, and some mention of ecosystems. Some of the participants explained that livestock grazing was detrimental to these areas. In 2012 and 2018, the conversations were not much different; however, once participant explained that the riparian area could filter water.

During each of the field seasons, the cottonwood (*Populus* spp.) forests, in riparian areas, were described as beloved. In 2006, participants claimed that livestock and wildlife inhibit cottonwood growth. In 2012, some blamed reduced cottonwood health on other factors, such as human impacts, temperature changes, and disease. In 2018, the team put extra effort into soliciting comments regarding cottonwood forests, and found that out of love or worry for, there was a general awareness that the cottonwood forests were “aged.” Some speculated that grazing, beavers, squirrels, and erosion were detrimental to cottonwood health. Participants explained that cottonwoods need “a lot of water.” Some noted that sapling cottonwoods appeared after flood water recede, yet no one suggested more flooding as a means of enhancing cottonwood regeneration.

River Corridor

Corridor Discussions—2006

[It’s] where the deer, geese, [and] ducks [live]. I just call it wildlife habitat. It’s not a corridor. Corridor, to me, is a runway. (Segment I, Agriculturalist, 2006)

To me the corridor of the Yellowstone River is where the river is, but some people got the idea that the corridor is out here, all on the riparian areas, or all in the valley....I think the corridor has to be where the water runs, where you [have] control of the water....Some people wanted to try to put all the riparian areas in, which includes our farmland....we’ve got an argument with that....Some of them figure...you can call it a

corridor and then turn around and get out on somebody's farm just because the river, maybe a thousand years ago, went there. (Segment I, Agriculturalist, 2006)

I've heard 'corridor,' ...and I don't know what the actual measurements would be. I've heard they want to establish a corridor five miles from the river in each direction where everything's protected. What a bunch of crap that is! That's what worries people. If they did that, they'd have control of this entire place, and you wouldn't be able to do anything. You hear of these Heritage River deals, where they come along and see a house that you can see from the river, 'Well, you've got to take it down.' They can really shut you down. I think that's what a lot of...[environmentalists] want. And, the really radical ones, they don't care if I'm here or not. They couldn't care less about me, or anybody like me. They'd like to see us gone, actually. They'd like to see a buffalo range, and me in a sustainable village doing something that the government mandates that I do. (Segment I, Agriculturalist, 2006)

Well, if you're going to say corridor, you're going to have to define the boundaries. Is it a one-half mile or a mile either side of the center line of the river? [Will] that distance be consistent, or will it depend on whether you're on public or private land? (Segment II, Recreationalist, 2006)

To me, the river corridor is almost in three pieces. You have the river itself. You have the immediate riparian area that is river-influenced. And then you have the cottonwood corridors that are turning quickly to Russian olive corridors, some wetlands associated with the river, that kind of thing. It's a relatively narrow strip in most places. And then you have irrigated fields that are directly adjacent to that riparian area. That boundary is flexible depending on who wants to do some modification of the area. I think that corridor has to include the Ag areas that are immediately adjacent to the riparian areas because there is so much influence to the wildlife and how the river operates based on those fields too. The deer, for example, living in those riparian areas use the heck out of the Ag fields and depend on them. (Segment II, Recreationalist, 2006)

Designating a river corridor and keeping in that corridor? So, the minute it starts to wander out of that corridor, they fix it. Is that what you mean? Maybe environmentally speaking they set up this corridor and nobody can touch it—it's off limits to any industry. Is that what they mean? So, they can maintain it as a wild river? (Segment II, Recreationalist, 2006)

[A corridor is where] we aren't going to have any development along the river...[and] keep housing and development out of it. I assume is what they're talking about. That sounds fine. (Segment III, Agriculturalist, 2006)

As I understand it, they want to take land from the landowners along the river and make this river corridor. Let's say they have a corridor of a quarter-of-a-mile wide. That would take a good share of our productive land. I object to that. That's how we make our living. Then let's say the river continues in its wild, untamed fashion and it washes into that corridor.... They'll want another quarter-of-a-mile. (Segment III, Agriculturalist, 2006)

I agree with the [idea of a] corridor.... I mean it keeps the quality of life where it is.... There's something about walking down the road smelling a fresh cut alfalfa field. I've seen the corn field out there and watched a raccoon go into it, or a deer go by. That's just something that you want your kids to experience, just like you get to. The beet industry up and down the river, the smell of just all that, that's all a part of the quality of life. (Segment III, Civic Leader, 2006)

We actually looked into creating a river corridor here. We were going to have three miles of riverfront in conservation easement. We had our two neighbors, and myself, and between us, depending on how much land they put in, we could have had as much as five miles. Three miles would have been easy to do. And we had the Feds and State both out here several winters ago talking to us over a couple of months. It was a terrible worthless deal that none of us wanted. We were all excited and interested about doing it, [but] the way they put that program together, I don't know why anybody would do it.... The tax break is not significant. (Segment III, Agriculturalist, 2006)

I believe that there needs to be corridors.... Not only to protect the river itself, but [also] the wildlife systems that are in that river. I would love to see public funding in some of those issues. That is kind of wild for me to say considering I come from a Republican background. (Segment III, Civic Leader, 2006)

The land values are such that...It makes that river corridor the domain of the upper class. (Segment V, Recreationalist, 2006)

The river corridor is basically the river and its surrounding lands, the whole riparian area...it's not just the river, it's the trees, animals, insects, birds, the worms...the dead leaves that fall on the ground.... Ninety percent of Montana's nesting birds use riparian areas. Close to 60 percent actually lay their eggs there.... If you fly over in an airplane, you look down at the Yellowstone River, you see this big green lush strip running through the countryside. (Segment V, Recreationalist, 2006)

Corridor Discussions—2012 and 2018

People have different... expectations or ideas when they come here from particularly out of the area that don't know. And the Yellowstone can be very intimidating. You know, big water, big river and stuff. But you know, it's... What's nice about it... in this corridor here where you're floating within ear and eye shot of the railroad and the interstate and all that, it still can be a very peaceful and tranquil experience out on the river. (Segment IV, Recreationalist, 2012)

Pheasant numbers remain about the same. Let's see, along the corridor there, yeah. Further off river, antelope numbers are down. (Segment II, Recreationalist, 2018)

The river corridor? That's a term I've never used.... [But I guess,] the river itself is over here. So, the river corridor, the cottonwoods, and asparagus, is over here, and pretty soon if you talk to the old timers they'll say, "We've never had that island." Because the river

now is over here and there's an island in the middle of the river. And is this the river corridor because there is river around here and there's river around here? It's the way the river runs. (Segment II, Recreationalist, 2018)

Without the shelter belts, which are corridors from the river down, there wouldn't be quite so much [wildlife here] but those both create a corridor, so we get a good amount of traffic. (Segment IV, Residentialist, 2018)

I think the corridor is not just the river itself, but I think it is everything that surrounds it, and I cannot really put a mile on that, but you know there is Cow Creek up on the other side, Cow Creek drops in from the Joliet side. I think they are part of the corridor because that creek dumps into the Yellowstone. However, when you get up on the rocks on this side, and all sudden you are in the Broadview foundation where you are down 400-700 feet for water, I don't think that qualifies as a river corridor. That sounds more like mesa and its own microcosm out there. (Segment IV, Residentialist, 2018)

The river corridor is the lowland along the river, like the land that would be affected by the flooding, the land that would be self-irrigated by it, like the riparian areas, that's the corridor. (Segment IV, Residentialist, 2018)

I really don't know. I've heard the term [corridor], yeah. What they're referring to, I guess that depends on who you talk to probably... I've heard it used, but I really never knew where they were coming from or getting at, I'll put it that way. (Segment IV, Agriculturalist, 2018)

I really have not [heard the term], what do they mean by a river corridor? (Segment IV, Residentialist, 2018)

River corridor, where you can only build within, you can't build up by the river. Yeah, there's a lot of discussion on that. That's been a discussion for our county for a long time. There's a lot of opposition obviously to that, but lots of discussion. (Segment V, Civic Leader, 2018)

There's definitely a river corridor, like I say, that river has been all over this valley especially in this stretch. Like Mary said, it seems silly that we build houses in the river corridor. (Segment V, Agriculturalist, 2018)

And then you know, Google Earth now, I mean it's just clear as day that you come up the Yellowstone, you come up the Shoshone, you come up the Snake, you come up the Madison, and you know, it's just all building in because the rivers are our life, the rivers are our wildlife corridors, and the development comes up those drainages right to the boundaries. And that's cool, but how do we manage that interface and keep some of those things we cherish? (Segment V, Civic Leader, 2018)

Riparian Areas

Riparian Discussions—2006

The Yellowstone is one big riparian area.... It could be a low-lying area, a hardwood draw, there could be a thousand things they could use that terminology for.... BLM uses that term all the time.... It is like a big pasture with a little stream running down it. That is the riparian area of a big pasture. I don't think you can use riparian area with the Yellowstone. I think it is its own ecosystem. (Segment I, Civic Leader, 2006)

We have a huge waterfowl population that uses that...deer. Riparian areas support upland birds, as we discussed earlier, songbirds, raptors, [a] huge population of raptors, and provides a tremendous waterfowl hunting. To alter that, or to change that in any way right now, would be a national loss, a national tragedy. (Segment II, Recreationalist, 2006)

The water, I mean, it has to have riparian vegetation, the type of vegetation that you associate with the different riparian zones. (Segment II, Recreationalist, 2006)

Grazing is the one big management concern. If you overgraze it, you're taking out the important riparian vegetation, and livestock are breaking down the stream banks. Yes, that's a very common problem.... It'd be nice to have better livestock management along the river so you can return the riverbank back to its real riparian-type setting. (Segment II, Recreationalist, 2006)

The riparian area is what I would call the difference between, let's say the low-water mark and the high-water mark, and places where there is a transition between the land and the river itself. And that can be marshy areas that hold an incredible amount of wildlife. It's all unique plant life, and that sort of thing. Those types of areas—let's say a marsh area, for example, I know there's laws that guard against draining those areas and bothering those areas, at this point I think are largely effective. (Segment II, Recreationalist, 2006)

Do you want me to come in and tell you what you can do with your 160 acres? And what if that is where you put all our resources...and your plan ultimately was to...pay for your retirement. Then along comes the government and says now we are going to make this a riparian area. This is a green space, and you can't develop that. I have just wiped out your assets. The government has to be careful that controls don't go overboard...[and] start infringing on private development rights. (Segment III, Civic Leader, 2006)

Because of irrigation in this valley, this valley has changed tremendously from what it was in the 1870s.... This whole valley was an alkaline flat.... There was a nice riparian area, because the Yellowstone is a wandering river, but it was probably a mile wide at its most. Now it is ten miles wide. (Segment III, Civic Leader, 2006)

[The Yellowstone River is] one of the most important riparian areas in this part of Montana.... The riparian zone is a place that is adjacent to the river, and it extends from the river back two or three miles.... It's important for bird species and animal species...and aquatic [life].... [It] filters out the dangerous things that might filter into the river. It decreases erosion...and aesthetically it's very pleasing.... [It is nice] to kayak the river and camp along the shores in the cottonwood groves. (Segment III, Recreationalist, 2006)

The riparian area should all be restored. We have a lot of restoring on the river that needs to be done.... [A natural corridor is] a natural habitat area. It does not mean [a] lawn right down to the river that is sprayed with pesticide to keep it green. It does not mean that. To me, [the riparian area] is a natural, protective thing. Maybe there could be bike trails and walking trails so people can enjoy that. Not storage and parking lots. (Segment III, Recreationalist, 2006)

We are seeing such a change in philosophy even in the farm and ranch community about riparian areas. Everyone used to just perimeter fence their cows; you have a mile square section or half a mile depending on whatever land you own. And now they are starting to fence the riparian areas out, so the cows don't trample through the brush and that natural filtering system. That is kind of a farm management thing that is good for the environment. (Segment III, Civic Leader, 2006)

Bank erosion today is caused by inappropriate use of the riparian zone, primarily.... It's a tradeoff: do you want to have your cows and calves down in the river under the trees or do you want to take care of them somewhere else? Well, the old-style method was down along the river. Well, they trampled the shit out of everything. The Yellowstone is a big river, so you don't see it as much as you see it on the side channels. The Clarks Fork is awful. It creates nothing but trouble for us because of sediment coming down. It's a very erodeable country...it erodes something fierce. [And] it's got years of that sediment built up right in the flood channel. So, even if you were to correct it today, it will continue to move that stuff forever. (Segment III, Civic Leader, 2006)

I describe it as pretty.... Where we live is within a riparian area, close to the river and next to our alfalfa fields.... [There's] a lot of wildlife and [it is] just a pretty area. (Segment III, Residentialist, 2006)

With people moving in, a lot of people are fencing off the riparian area, [and it] is growing back. They're fencing it off, and...that's helped a lot as far as with the erosion to the banks. (Segment IV, Recreationalist, 2006)

The Governor's Task Force...did focus a lot of attention on the riparian zones... What are the alternatives of grazing management and what are the implications for riparian zones? What are the effects that riparian zones have on avian productivity?... [On] diversity and preservation of fish habitat, there is more public awareness...than there was say ten years ago. There's an awareness that a lot of what we've done to the river is to diminish the productivity of the riparian zones. (Segment V, Civic Leader, 2006)

Riparian Discussions—2012

It provides the alluvial water that allows us to get some sub-irrigation in like the hay crops that we have... That river bottom ecosystem produces just the right mix of vegetation that we need for goats. (Segment III, Agriculturalist, 2012).

It's kind of amazing, the combination of what the force of water can do but then also the fact that the Yellowstone, its primary trait or characteristic being a free-flowing river, that it seeks its course but it still kind of... Pretty amazing... And obviously there's a lot of, you know, it has impacts on my community. I'm sure it has very significant impacts on the agricultural community and other communities that rely on the, I don't know, the riparian area of the river... and the fish, you know. (Segment IV, Recreationalist, 2012)

The riparian zone is more between like the upland/dryland area and the riverbank. It is where there is more water and trees grow because of the water there, and there can be wetlands. And I think it can be easily damaged, if you have... the cows coming down to the river to water and too many people...can damage it. But it is like the connection between the river and off the river... I think it is important because that controls pollution. You know, it controls erosion, especially erosion. That is what can keep your banks stabilized in the high runoff years. If you have tree roots growing there to hold the soil and grass and stuff. So, if you just have a bare dirt bank, it leaves pretty fast. (Segment IV, Residentialist, 2012)

Development along the river is not good for the river, depending, you know if it is set back and so it is not impacting the bank too much, not impacting the riparian area and/or the experience of floaters, okay. (Segment V, Recreationalist, 2012)

There are so many types of species that live in that [riparian] zone, you know, rodents and beavers and otters and different birds and fowl... golly... Willows and things like that are always key to the riverbanks, and I think there's a lot that relies on the willows, I suppose even the deer that eat the leaves and stuff. It provides cover, it provides... Or the small cottonwoods that, you know, start to grow on the gravel bars after an event like last year for example, you'll start to see those guys sprouting up probably... And you know, that's a good and bad thing. But I'm sure that those, the cottonwoods, they provide a lot of habitat for a lot of things. (Segment IV, Recreationalist, 2012)

It's such an important, vital ecosystem... it carries life for not just people but so many species. So, in a very real and practical way too, it represents life. So, it needs to be protected. (Segment V, Residentialist, 2012)

Riparian Discussions—2018

When it's [the river is] eating away on older timber areas, you know, the big cottonwoods slough off, the woody plants end up in the river as structure, and you're familiar with structure in any aquatic area, that's cover for fish and everything else. And while it's doing that, it's depositing on another location, and as soon as enough soil stays long

enough, it starts growing willows and starting a new forest. So, that's the continued process. (Segment I, Residentialist, 2018)

The benefits from the water, what it does. The wetland, it's basically a filtration system. So, it filters a lot of the chemicals and the things that go on, and so, before it ever hits the streams. It obviously provides drinking water for all of the different animals that come by. And then it sets up a lifecycle, so when the birds fly through or stay there, that they have what they need to rebuild their bodies and the nutrients that they need to continue to a different place... Actually, Montana is, of the 48, Montana is third in the duck population for the breeding grounds... So, it's a very important area, and our waters are very important because of that. (Segment II, Recreationalist, 2018)

It's the area between the river and our fields that you can't... you know, it's full of Russian olives, cottonwood trees, different types of brush, very good wildlife habitat... I'm sure it limits the erosion with the good grass, and even the Russian olives. The more vegetation, the less erosion I believe, so that's all good, I think. (Segment III, Residentialist, 2018)

I think it's very important [to the birding community]. I don't know the figures, but a very large majority... of the native species of birds that... breed and/or winter in Montana, use riparian areas. (Segment III, Recreationalist, 2018)

Riparian areas are a mess, they're ruined, there are weeds everywhere... everything is going to grow in the wetland, that's where the life is. (Segment IV, Agriculturalist, 2018)
Oh, in my mind riparian area is just the area surrounding the river, within the footprint of the river, in my mind. From where we are at, my yard I don't think is the riparian area, but once you get down to the foliage that I have surrounding the water, I believe that would be termed riparian, in my mind. (Segment IV, Residentialist, 2018)

I just heard the name [riparian], thought it would be something for birds... So, there's overflow, there's ponds, there's marshes, and it is good for the ducks and the geese, which I harvest and eat. (Segment IV, Civic Leader, 2018)

Cottonwood Forests

Beloved Cottonwoods—2006

Cottonwoods are the classic Yellowstone River tree. (Segment I, Residentialist, 2006)

I love cottonwood trees. There are a lot of those. In the wintertime, there was a family of squirrels living in the cottonwoods, and I used to bring them nuts, you know. They really enjoyed that. I don't know if that was a good idea.... One reason I started feeding these squirrels, I seen this big pile of cockleburs, half the sides were eaten off.... On the inside there is a real nice nut that tastes about like a sunflower seed. They can live on those; they don't need anything else.... There are plenty of cockleburs, there. (Segment I, Recreationalist, 2006)

The other thing you see is the removal of the cottonwoods replaced with farm drills. Anytime you take out the woody vegetation and replace it with...whatever, alfalfa, or wheat, or crops, you're putting those lands at risk. You know, especially the willows along the stream bank. (Segment II, Recreationalist, 2006)

Well, [cottonwoods] give a lot of shade, and, at one point in time [we used them]. For instance, our old barn, the floor in it is made out of, probably four-inch slabs of cottonwood....It's in the old barn, in the old horse barn....And then from the fact of shade, and this type of thing, and habitat for the birds and one thing and another....And like I say, at that time way back it was used for lumber, and fence lumber, slab lumber. A lot of our corral fences were slab lumber, cottonwood and this type of thing. But, right at this point –in time, lumber-wise, they're not a thing of value, so to speak. (Segment IV, Agriculturalist, 2006)

[A free-flowing river] helps with cottonwood regeneration along the river. Cottonwoods are important for breeding birds.... Cottonwoods need sandbars to germinate the seeds, and if you don't have a free-flowing river to help shift the course of the sandbars in the river then cottonwoods can't regenerate. And if you don't have trees along the river, it decreases the [habitat] for the birds. (Segment III, Recreationalist, 2006)

I have seen farmers take a wonderful, old...stand of cottonwood [and] doze them right into the river, so they can farm right up to the riverbank. That's something that I understand what they are doing, trying to increase their farmable acreage. But what are they really doing? Those cottonwoods are there probably helping that farmer more than what he realized. (Segment II, Recreationalist, 2006)

Now, the cottonwood trees are a hindrance for erosion because when the water gets in there...close enough, then they tip into the river. They take a lot of bank.... Plus, they open up another hole for the water to get in. So, normally, if you're really going to manage the river good on some of these places, you go and cut down those trees ahead of time so there's no tops to them, [and] all you [have are] the bottoms. (Segment I, Agriculturalist, 2006)

It tends to cut, even in places where you think the bank should be stable. We have some huge cottonwood trees that went down this year. You'd think those trees would hold that bank, but they don't. (Segment II, Recreationalist, 2006)

They've wanted to reseed the cottonwoods, I've heard, and a few things like this. Well, you're not going to let the cottonwoods grow in your field anyway; you're going to tear it up and get it ready for next year's crop. So, you know, I feel like it's the right of the landowner to be able to stabilize his banks when needed and he needs to do it responsibly, there's no doubt. (Segment II, Agriculturalist, 2006)

Those old cottonwoods started toppling. When a cottonwood topples, the roots stay there, and [the top] falls down. That current hits it, and it's just like a cutting torch. It cuts back into the bank. We'd have probably been five acres ahead if we had run over there with chainsaws and cut the trees down. (Segment I, Agriculturalist, 2006)

And the cottonwoods, they take 1000 gallons a day. In the fall, when the trees and stuff go dormant, the river raises ten inches. All of them trees and stuff, all the water that they're utilizing—how much [are]...[they] sucking out of the river on a drought year? (Segment II, Agriculturalist, 2006)

When these erosions begin to take place, these big cottonwood trees that are along the Yellowstone River start to hang out over the water, and another year or two they will get washed out and when they tip over, they come out with roots and all, and there's where you cause a lot of erosion right there. If they were to come along and catch those trees as they get in the leaning position, a year or two ahead, and stump them off, and either float the tree on down the river somewhere or hook onto it and drag it out, and deposit it somewhere, they wouldn't lose near the ground that they can lose now....Like I say, when those big cottonwoods go over, they cause a lot of turmoil....They bring out a lot of that old mud and dirt and everything just goes on down the river. (Segment IV, Agriculturalist, 2006)

[In] a meander-area, an island gets started by willows, and then it gets taken over by cottonwood. Out in the hills...you don't see young cottonwoods because it is such great feed. Everything loves to eat cottonwood.... We will go along this trail [where we] see the old and dying cottonwoods. There is nothing young to replace them. (Segment I, Recreationalist, 2006)

The trees along the river...are generally cottonwood, and I hate to say it, but it's Russian olive. Russian olive is a noxious weed, and they grow really well down here. (Segment I, Recreationalist, 2006)

Continuous grazing kills the cottonwoods.... I have to believe that [after] the big herds of buffalo came through and grazed really hard, they wouldn't be back for several years. That would give young trees a start. (Segment I, Recreationalist, 2006)

When we have the floods, it's great. The flooding is wonderful because it brings the cottonwood seeds in, and we have new cottonwood stands which will help the bank.... We like that for stabilization. But we haven't had a good flood for a long time. I can't remember the last good flood. (Segment II, Agriculturalist, 2006)

Mother Nature does some erosion control by putting some trees in the water, bushes and...things like that. We have seen a decline in cottonwood trees in our area. I think that's from chemicals and stuff in fields. Those cottonwood trees don't grow, so that takes away some of your growth and therefore erodes some of it.... You just don't see many cottonwood trees around here anymore. (Segment II, Recreationalist, 2006)

I realized...[that] if you don't have flooding, you don't have new cottonwoods growing. (Segment III, Agriculturalist, 2006)

My place is unusual because a lot of my pastures are covered in high water and...it reseeds all of the cottonwood trees. One year, before I did the diking, the river ran into the field and the cottonwoods grew like grass. I turned the cows in, and they ate them like grass. (Segment III, Agriculturalist, 2006)

Well, you know, if you look at our trees, they're all mature trees. Go down along the river there, there aren't any young trees anymore. Because the only time you get any natural cottonwood reproduction is during the flood years. The seeds come down, they flow down, they get imbedded in the mud from the floods, and that's how you get the cottonwood stands.... Flooding is necessary for the regeneration of the cottonwoods. That's a good reason why not to do anything, from my point-of-view. A lot of people disagree with me. (Segment IV, Agriculturalist, 2006)

The cottonwoods...are dying here.... There are trees...right along the water, getting plenty of water, and you'll see...a branch that will die and next year will be another one and another one.... And...the canopy does a lot of things. It's a great thing for wildlife...when we have heavy rains, it keeps the silt run off and all these things.... And I really don't see a response from the state or the federal government really trying to figure out exactly what's happening. (Segment V, Residentialist, 2006)

Beloved Cottonwoods—2012 and 2018

To some degree seeing the river move around a little bit, that's how the cottonwoods get re-seeded. And [as a fishing guide] in terms of trying to educate clients is, as we float down the river, that's certainly one of things to try to explain to them, that you know, it's difficult for humans to live along the river that in a cottonwood bottom with a gravel bottom river that tends to move a lot, but seeing those new channels and seeing that movement is, to me, just part of the natural course of things. (Segment V, Recreationalist, 2012).

We irrigate with river water, so I have cottonwoods in all of my flower beds. (Segment I, Agriculturalist, 2018)

Cottonwoods always seem to do good. The ash trees will die off but the cottonwoods, they seem to do real well in this climate.... We got some pictures of us hunting with a bunch of cottonwoods on a sand bar this tall; they are all 30 feet tall now. The cottonwoods are just resilient; they'll grow anywhere. (Segment I, Recreationalist, 2018)

Down on the riverbanks, we don't get the tree growth as we did. You can tell it. (Segment I, Recreationalist, 2018)

Not so much. There's an awful lot of big ones, you know. There are places where you see them. But they're not coming back like Gangbusters. (Segment III, Recreationalist, 2018)

Well, we used to have a lot of [cottonwood trees], and they fell in... The only ones left you can see them right out this window... But we have a lot of new ones coming....

There's twenty-foot trees down there now, and they actually grew off the roots of the old ones that were there. (Segment III, Residentialist, 2018)

We've got plenty of good-sized cottonwoods... [and] there's all kinds of seeding cottonwoods coming up down there. (Segment IV, Agriculturalist, 2018)

You know, I could be totally off base here, but I don't know that I see young growth. It seems to me, I see a lot of big trees, and they are the ones that end up in the river and whatnot, but just I don't know that I see as much young growth as maybe should be there and I don't know what to attribute that to... That's my thought. (Segment IV, Recreationalist, 2018)

I've heard that cottonwoods are having all kinds of trouble because they're not being regenerated... the old growth cottonwoods are old, and the new growth cottonwoods aren't coming. I mean, because maybe they're getting eaten, or maybe they're being cleared out, maybe something's causing the new growth from not happening. (Segment IV, Civic Leader, 2018)

A lot of them are dying off, and lot of new ones starting. So can't see much difference in them. (Segment V, Agriculturalist, 2018)

There's a lot of cottonwoods. They're dying out; they're old. (Segment V, Residentialist, 2018)

You know, it's hard to track the cottonwood changes, because they are so gradual. And a lot of the cottonwood issues are related to regeneration (Segment V, Civic Leader, 2018)

After we have the hightide in June, and if it's an exceptionally high year, it will flood some of our lower pasture ground. And usually in the fall we'll see saplings. In the spring they'll start growing. We see an abundance of cottonwoods... There is so many of them, it's phenomenal... We irrigate... and... the river has planted through irrigation cottonwood seeds on our shelter belt. So, it's a good trade. (Segment I, Civic Leader, 2018)

The only places you see those things really coming is where it's had standing water, it's just really wet. (Segment I, Residentialist, 2018)

After a flood, it'll break out some new ground, flat, and then when the river recedes away from it, the cottonwood seed is there, and little cottonwoods will come up all over the place. (Segment II, Recreationalist, 2018)

It's the river... Is it going to get out on that field down there? Some years... You just have a lot more sand and asparagus the next year, cottonwood trees, whatever it brings in. (Segment II, Recreationalist, 2018)

Usually if it floods pretty hard, after it's done... It can bring new cottonwoods in. Little saplings will pop up here and there. Sometimes they make it, sometimes they don't. (Segment II, Agriculturalist, 2018)

The river is high this year, and so a little later on it'll be just a mass of little cottonwoods about this high. And some survive and some don't. And that's what regenerates itself too.... I think [the river] spreads the seeds out. (Segment II, Agriculturalist, 2018)

You know, I want to see some new ones because every year we'll have at least three or four ginormous cottonwoods that will fall over or a big windstorm will push them over, something will happen to them, or they will just die. (Segment II, Agriculturalist, 2018)

Once they get to a certain point, they start dying out, thinning out. Or the river comes along and wipes them all out. Good ice jam is kind of tough on them too. (Segment II, Recreationalist, 2018)

Most of [our cottonwood trees] are gone... when we lost our forty acres down there, that was all covered with cottonwoods... I used to go out there and play when I was a kid. It was full of big trees. They're all gone. We only have... ten acres left with some trees on it, and a lot of those trees are dying and falling over. So, we don't have very many trees left. (Segment III, Agriculturalist, 2018)

That was the only good thing about the 2011 flood, is that there were a lot of new cottonwoods that started...I don't think they come up any other way—I think there has to be a flood. (Segment III, Agriculturalist, 2018)

[We have young cottonwood trees] in the riparian area too, I guess probably more where we've had flood water. It seems like that's where they show up. Yes. (Segment III, Residentialist, 2018)

All those years I sat on the Task Force, one of the things that we were taught was that flooding is the only way the cottonwoods regenerate... [And] there's a lot of places.... [where] there's a stand of cottonwoods that runs along the ditch, because the ditch provided the water... I'm guessing we are probably losing some cottonwoods in some of those areas just because of changes in, you know, changes in ownership and land use and irrigation practices, we're probably losing some of those. (Segment V, Recreationalist, 2018)

I will say this year was a bad year for the cottonwoods because of the drastic high-water season. I mean, our river hit 36,000-cfs this year. So... there's a lot of cottonwood trees that have got uprooted that are just beached in the middle of the river now. And I don't know if that's normal. Maybe that happens every ten years or something. (Segment V, Recreationalist, 2018)

I guess some of the mature stands, certainly we've seen loss of some of those... along the river, you know, I've certainly seen us lose some with flooding and bank erosion and old

age and all the usual things that happen to cottonwoods. (Segment V, Recreationalist, 2018)

No, not really [any changes]. Except the ones that have fallen down during high flood water, you know. (Segment V, Civic Leader, 2018)

The sad part is, if you're grazing, then the cows will keep those cottonwoods out because everything loves cottonwoods.... So, if you graze an area along the river where you've got all these young cottonwoods, that's one of the first things they'll eat. And they'll eat them down to nothing... Now, if you have a big ice like in 2011, we had the big floods, we had huge areas of new cottonwoods coming up. And if some of the landowners could've noticed that, they might have held off on the grazing... We had thousands of little cottonwood seedlings. So, I didn't farm it until... about 5 years.... And when I went back and tilled the field back, we left 3 big patches of cottonwoods. It's pretty cool... But, my neighbor said, "I've got to get in there [and] disc those trees before they get established." That's what he said. And I understand, it's economics, too. But... when that happens, and your field is in a place where it's going to get eaten away by the river anyway, and you have the opportunity, you should let it be. The trees will slow that process down. (Segment I, Residentialist, 2018)

We have a large deer population in this country, and those deer in the wintertime they like to go eat those cottonwoods down to the ground. (Segment I, Civic Leader, 2018)

Oh, yeah. Tons of them.... I noticed that there's not very many new ones coming back... We have two pastures down there and we keep them [the cows] in one pasture and not the other one... I've noticed that that's helping some of the new cottonwoods because they are not eating the leaves off of them. And then once the fall comes and the leaves are off, then the cows can go in there. So that's helping them some, but no I haven't seen much new cottonwoods coming in. (Segment II, Agriculturalist, 2018)

By the time they get big, some beaver comes along and finds them and takes them away... That's what's so hard on the cottonwoods. (Segment II, Agriculturalist, 2018)

And cottonwoods... what we have noticed here is we still have beavers and stuff around, so they keep the cottonwoods chewed up... So, we don't see a lot of cottonwoods growing up the creek so much anymore. We try to protect some of them, put some wire around them, keep the beavers off them. (Segment II, Recreationalist, 2018)

Squirrels eat the hell out of them... The squirrels are just horrible on the cottonwoods in town. They eat off all the small branches off the cottonwood trees. And they just tear it apart. (Segment II, Recreationalist, 2018)

You know, they get brown spots every once in a while. I blame it on the squirrels. They take off branches for building nests, but I don't know what it is. They get a blight in them once in a while, but basically, they stay pretty healthy. (Segment II, Agriculturalist, 2018)

We do have the ones [cottonwoods] that the goats haven't found yet. The deer tend to like those a lot too... But you know it's amazing, you'll see like these spots where... in a little tiny area, hundreds of cottonwoods would start. There is a reason that there has to be hundreds of them though, because they do seem to be the favorite of every wildlife while they're trying to get up. (Segment III, Agriculturalist, 2018)

Beavers are taking mine... Those pesky beavers are about to drop two more cottonwoods, so there's that... Living on the river, yeah... they're brilliant right now; they're really gorgeous. I don't know. Other than beavers, mine seem pretty healthy. (Segment V, Civic Leader, 2018)

They... were doing quite well until the beaver came along... And we need to fence all those in too, the young ones, so that doesn't happen again. (Segment V, Recreationalist, 2018)

We have more trouble with the beaver than the river. We had three big trees cut down last year by the beaver... I put wire around the trees now. Eventually I think all of our cottonwood trees will be history. The cedar trees are kind of taking over down there naturally. I don't know, we've never planted those. (Segment V, Recreationalist, 2018)

The leaves... fall early, like they're diseased. Yeah, the cottonwood leaves. They've got brown marks on them and... they fall real early. (Segment I, Recreationalist, 2018)

I've asked a lot of people, and nobody has an answer, but we have such a change – we will have a record high in January and then two weeks later a record low.... A couple years ago, it's been probably ten years ago now... It warmed up really good and the trees were budded out, and then it got down to thirty below... You could hear them [pop] like a gun going off because they were freezing... All the juice [had gone] back up in the tree, then when it got thirty below, it was just like when pipes freeze.... And it killed all of them, all the big cottonwoods started dying off after that. It busted something inside them... It sounded like people were shooting. (Segment I, Agriculturalist, 2018)

The cotton last year wasn't very thick either... which made my wife happier than hell... It was nice not having a lot of cotton, because when your swather... plugs up, you got to stop and clean them off. (Segment II, Agriculturalist, 2018)

They pollute a lot during springtime when they blossom out. We're finding the cotton plugs up everything; it plugged up our sewers, it plugged up any air conditionings that people used, so we're learning... we do not want them anymore... so we did pass a law that you cannot plant a cottonwood tree... that's a city ordinance... We're still planting cottonwood, but they're the cotton-less trees which are good. (Segment III, Civic Leader, 2018)

It is wonderful sitting under them, but as you can see there's cotton flying. It's dirty looking and it's hard if you have allergies.... We are replanting something else. (Segment IV, Recreationalist, 2018)

They need a ton of water. They are thirsty. But on the actual river itself, on these islands down there in this part of the river, there are so many cottonwoods out there you can't walk through them now. Five years ago, everyone was saying, "Oh, no cottonwoods, there's no cottonwoods." But now five years later they're about seven feet tall. They're growing like crazy.... [But] the beavers are always up working around here... they work on the cottonwoods... they'll cut twenty of those little cottonwoods down... [It's ok because] right now it certainly needs to be thinned out. (Segment V, Agriculturalist, 2018)

Section 9. Understandings of Management

Concerns about river management regulations and the administering thereof were quite common across field seasons. For acquiring bank stabilization permits, many participants explained the permitting process as time-consuming and extensive. Participants voiced concerns and some confusions about the various agencies that needed to be involved, but the COE was noted as the “ultimate arbitrator,” with a great deal of power.

Even so, in 2006, some participants described positive experiences with the regulatory process as well. While they found the permitting process lengthy and expensive, their overall experience dealing with the various agencies was positive. Some expressed gratitude that they were grandfathered into their stabilization projects. Other 2006 participants, made specific comments about their understanding of new regulations requirements expressing dismay with the lack of information concerning new rules.

In 2012, participants from Segment V commented on their confusion with the Special Area Management Plan (SAMP) and the Governor’s Task Force, and in 2018 some described a shift, noting that the COE was a lot more involved in general river management than previous years.

Despite the grumblings from some participants, in each field season, there were other participants with positive, or at least neutral, things to say about the COE. Participants offered suggestions for improved management. In 2006, many participants described gaps in management or a lack of understanding. By 2018, comments from participants had shifted toward wanting proactive programs.

Navigating Regulations

“Oh, the hoops!”—2006

I think the rules and regulations are pretty stringent about placing concrete alongside of the riverbank. (Segment I, Agriculturalist, 2006)

I don’t know if you could jump through that many hoops. That is something that they should make easier, besides the cost. You should be able to go through the hoops a little easier to do some riprap.... Sometimes they will work with you and sometimes it is tough, especially on the Yellowstone. They watch it pretty close. People want it left natural...I can see their point-of-view. (Segment II, Agriculturalist, 2006)

The answer of the moment is riprap, and if you can get the Conservation District, the DEQ, and the Corps of Engineers to agree with you, you have some chance of applying riprap. Of course, we apply riprap entirely different than we used to. It’s not chunks of rock or concrete dumped in there; we’ll net it, and vegetate it, and fertilize it. If you can establish the river willows in it, you have a much better chance of saving something. It’s not cheap, and everybody can’t do that. (Segment II, Civic Leader, 2006)

You have to go through quite a process of applications. (Segment II, Agriculturalist, 2006)

[I] always have had such a time getting permission to do something about river erosion. But I've always looked at it and wondered, 'Is it better to watch that dirt fall in the river all the time and all the soil going down, choking up the waterway?' 'Is that better than doing something about it?' (Segment II, Agriculturalist, 2006)

Erosion is very serious, and, because of the laws, it's almost impossible to protect your land.... The Greater Yellowstone Coalition and some of the other environmental groups sued because...[riprap] was supposedly ruining the river.... They didn't care about the landowner losing his property. They wanted [the river] to just go wherever it wanted and wash their homes over. And there were some homes that...[were] damaged.... It's more the agricultural land down here that's being lost. About 150 acres [were lost over] 25 to 30 years.... One year you'll lose 30 acres, and the next year you might not lose any.... But you still can't build riprap. (Segment II, Civic Leader, 2006)

Because of...303 permits, and people objecting to doing anything.... We can't protect [it] anymore. And we've probably lost 150 acres of land that the river has washed away. (Segment II, Civic Leader, 2006)

You don't want the troublesome fight.... For example, [when] the Hysham water ditch system [needed to have some work done] they had a tough time getting permission for that. (Segment II, Civic Leader, 2006)

There's still a lot of management issues over erosion.... Landowners [with] a lot of erosion problems [talk about] getting permits to riprap and doing it in a way that doesn't create... [a problem for] other property across the river. It's not easy to get a permit to do much work on the riverbank.... [Loosing productive ground] can impact us from a tax base because he's got a couple of irrigated fields in jeopardy. (Segment II, Civic Leader, 2006)

It's a shame, because money talks...and with a local board you get that good old boy syndrome. It...[isn't] what you know, but who you know.... The board's project is more important than the guy down the road that had his paperwork in a day later. And that's the biggest problem....[We] have to take the money aspect out of it [or] regulation won't work....Unfortunately, we're in a world where money rules. (Segment II, Recreationalist, 2006)

I know that it's eating up the bank on this side.... The bank has really caved in.... They've tried different things, but everything they seem to suggest the Army Corps of Engineers says, 'Nope, you can't do that.' They've tried riprap in different areas in different ways, and the Army Corps said, 'Nope...it's not ecologically safe, or it's not economically feasible, or it wouldn't work'....I would like to see [something] because I don't want my river to go away, and I don't want my town to go away. (Segment II, Residentialist, 2006)

I know you have to jump through a lot of hoops. The Corps of Engineers is one, the County is one, [and] Fish and Game. (Segment III, Residentialist, 2006)

Make a comprehensive plan as to what is allowable and a process to permit it with ease, rather than fighting every step of the way.... You get it so difficult, people just say, 'It's not worth the energy [to get the permit.] We'll do it anyway...[even] if they put us in jail.' And I can't blame those people. (Segment III, Residentialist, 2006)

I can't do anything now because of the permit system. (Segment III, Agriculturalist, 2006)

I think we ought to reinforce the banks.... [Erosion is] endangering the canal that feeds the sugar beet, barley, and corn farm area of Yellowstone Valley.... You lose that canal system, you have no food. And yet we can't do anything to it. The ditch company couldn't even get permission from the Corps of Engineers to protect the ditch, something that's been there since 1890.... They spent over \$100,000 trying to protect the ditch, but they can't get permits, can't get in the water, can't do riprap, and can't protect it.... They used to allow riprap on the river, but they've made a decision in the last several years not to do that, so they don't allow anybody to do it. You can't even protect it in Billings. (Segment III, Agriculturalist, 2006)

I think many landowners just don't have the patience, number one, to go through the process. (Segment III, Agriculturalist, 2006)

Often times, before you can get your permit, the damage has been done.... All these various approvals...take from three months...to six months, maybe. But the damage is done and over before you can get [the permit]. (Segment III, Agriculturalist, 2006)

And then you get people across the river or downstream that just throw concrete on the edge of the bank, let the riverbank wash out, the concrete falls in and looks like hell and they don't have any problems and yet I got hassled the whole way trying to do it [bank stabilization] right. And that is very disappointing to me. (Segment III, Residentialist, 2006)

Most of the time, people haven't taken the time to determine how to go about it properly. They don't go through the permitting process correctly. Traditionally, what happens is they will do something inappropriately and then it sends the problem farther downstream, to the next guy. (Segment III, Recreationalist, 2006)

All he wanted to do was riprap to save his bridge.... At one time, he had 20 guys standing down there on his bridge, discussing what he should do. Bridge finally washes out and down in the river it goes. The next day, to save the road, they are hauling big boulders, dumping them in...and, of course, in the spring he had to haul his bridge out. That's required.... But there you go. When you're dealing with water, you're dealing with a lot of different people. (Segment III, Residentialist, 2006)

We have not had the best of luck with some of the agencies. They all have to sign-off. The people who are in those roles, some of them, have been less active than others. We have had permits sit on their desk six months, and [we] get it back signed with no comments. (Segment III, Agriculturalist, 2006)

My husband wants to build a pond out front, and he would like to put a boat ramp in the back, right on the river.... We haven't really seen a lot of requirements, other than they want to know what we're doing, exactly how we're going to do it, and what we're going to use when we do it, which I can completely understand. They don't want us messing stuff up. They're pretty particular about what's going to be used and what's going to be done.... They even want to know how we're going to restore vegetation after we're done working. (Segment III, Residentialist, 2006)

I petitioned every agency that you have to...to build in four weirs.... We went through four or five agencies to get this done—and write this down—the Corps of Engineers was the slowest moving, hardest to...just follow up. I tried to do everything ... engineering drawings, pictures, whatever. It took forever for the Army Corps of Engineers to move. Bless their heart, they did. I was good friends with the gal that ran this deal out of Nebraska, and I certainly knew her on a first name basis, and her birthday, because I talked to her every other day. I asked her where it was, and she said it was sitting on somebody's desk. (Segment III, Residentialist, 2006)

That flood, it took probably three or four acres of ground where our irrigation system was and just completely wiped out our source of water. And we had to go through a quite a lengthy process of going through the Extension Service and the Conservation District and State of Montana...Corps of Engineers...to get permission to...lay an underground culvert farther up the hillside and tie it into that system at another point and rebuild our irrigation system. (Segment III, Residentialist, 2006)

They change the rules. Like if we want to do something in the river, we have to go through six agencies to do all this crap. Laurel was having trouble getting water. They just take bulldozers and drop them in the water and do whatever the hell they want. If I did that I would have been fined quite seriously. So, they don't enforce the laws equally either that do exist. (Segment III, Residentialist, 2006)

It took us two years to get it permitted to do it right.... We lost 20 to 40 acres. Had we...done it without the permit, we'd have saved that land.... We stood down on the river bank looking at the project after we did it...[and] DEQ guy was complaining about a couple of inches variation in elevation....Yet we looked across the river where they had dumped in car bodies and concrete without permits. I said, 'How can you give me a bad time about doing it right, but being off a few inches in elevation, when you can stand here and look across the river and not do anything about what everybody else is doing?' ...If I've got a permit...he's going to make it miserable for me. (Segment III, Residentialist, 2006)

We did a little riprap on Bridger Creek last fall, and there were six or seven agencies involved in that permitting process. The county was involved in it. We were working for the county. They were trying to protect county roads. It took months. (Segment IV, Residentialist, 2006)

I've worried a time or two about some of these regulations that the government has on it to where you can't get some very simple things done in a timely fashion. By the time you wrestle with them, the condition has changed, or gotten worse, or whatever. That would be one of the complaints.... And then you get disgusted, and then you get discouraged, and then you quit....[and] just say, 'The hell with it, they're going to do what they want to do anyway'....But there's got to be communication. There's absolutely got to be communication. And you['ve] got to have it from the engineer, and the hydrologist, and the old farmer/rancher, and grandma and grandpa, and everybody. And you got to talk about it, and discuss it, and see what you can come up with. That's just that simple. (Segment IV, Agriculturalist, 2006)

Oh, the regulations.... The hoops you have to jump through to get a permit to do anything.... I wish [the Corps of Engineers] were more accessible.... We have a perfect example....We're having a problem on Bridger Creek with some people not complying with...stream regulations, and took them a long time to pay attention. But now they are coming. It just seems like it takes a lot to get them. (Segment IV, Civic Leader, 2006)

I wish they would be more responsive when there was an emergency. We've had some riprap that's been washed out in two spots by the Grey Bear Fishing Access. We would like to have got it repaired before flood season. And we still haven't heard back on our permits.... [The river] just washed out two pieces probably: one was probably about 15 feet long and the other one was probably 20 feet long. But there's a good chance with high water now it will probably all be gone.... So, it's one of those deals where we could have got to it right away when we found out it was...and part of that is our problem for not really looking at it close enough until we started thinking about high water. (Segment IV, Civic Leader, 2006)

They have almost shut down any bank stabilization.... I should do some bank stabilization, but I don't know if I have it in me to take the guff that it is going to take to get it done. It is tough to have to do battle.... I just dread it. (Segment V, Agriculturalist, 2006)

We counted them. There were thirty-one different representatives from different agencies [involved in our project] We had an engineer that should have known we had to re-apply, and he didn't even know. (Segment V, Agriculturalist, 2006)

[During] the last bank stabilization project...it got kind of tough, and [there were] a lot of inspections, and it raises the expense, and you have to go for public review. I don't want to be a public person. All I wanted to do is ranch and do my thing. I had no idea I would become a public figure and be in the New York Times. (Segment V, Agriculturalist, 2006)

[People] have to actually apply for a 310 permit. Once they apply, the District Conservation Board will go out and observe, and look at the project and make recommendations, and either pass or ask for more details and a better plan.... They try to re-vegetate everything now. They used to throw a bunch of rock over the edge. Now they are actually putting riprap on the bank. They aren't allowed to put it into the river. (Segment V, Civic Leader, 2006)

That guy came down from Helena and looked. He said it needs to be riprapped. And when he made out our application, he changed it and said that it will be an ongoing project. So, he made it so that if we need to riprap there some more, we just go ahead and do it, so we can protect our pump site.... He showed a lot of common sense. I said, well, really what we should have done is just started there so everybody else could have rubber stamped it after he made his decision. But, it seems like the Fish and Game wants to spend a lot of time dabbling in our business too. (Segment II, Agriculturalist, 2006)

I got a pump that was there in 1903 or '04. So, I can do anything I want to that pump sight because it's established. [When] my son [applied for permission to put in a new pump site] they had to cut down three trees to make the paperwork. It was a humongous pile of paperwork to put a pump site in there. (Segment II, Civic Leader, 2006)

We didn't have too much trouble with the permits. They went pretty good. Not saying we didn't have little problems once in a while. Just misunderstandings. We get along pretty good. The only thing was I couldn't get any money to help. To [riprap] is awful expensive. (Segment III, Agriculturalist, 2006)

Well, it's going to take some time and you have to kind of get ahead of the curve. If you've got a certain time schedule.... you have to get started, [but] like I said, we found them very reasonable. (Segment V, Agriculturalist, 2006)

The banks have to be stabilized, and we have had to do quite a little of that since we've been here—thirty-seven years. But we've always had good cooperation from the Bureau of Army Engineers and the...Fish and Game and those [in the] conservation services. I think they've treated us fairly.... We've always left some riparian area there along the river. We never graze that real hard. There's always a lot of grass and brush and things like that, and I think that's probably one reason we've always been able to get along with the Fish and Game and the Bureau of the Army of Engineers because we've always tried to leave the riparian area there next to the river. (Segment V, Agriculturalist, 2006)

After the flood, they built concrete all across the front of the house up to this floor. Then they put the huge rocks in.... It is [a] concrete wall...[and] there is the barb. I am pretty safe. It was nothing like this before.... They are saying you shouldn't riprap, but this is my home. The engineers will allow me to repair this.... If anything happens, they will let me fix it. I am grandfathered-in. They will let me do that. (Segment V, Residentialist, 2006)

Our other problem is that they are understaffed. With this economy, enforcement [of regulations] is not an option.... In order to do the enforcement you have to have the tools. It has to work from the top down. You have to have a county attorney that is willing to prosecute. (Segment I, Civic Leader, 2006)

I've seen several guys in the past put in riprap. The way to do it, right, would be to go in with big rock....Some people used to put in metal and cables, years ago, [but] they haven't done that in a long time because that's just an accident waiting to happen....You get that sharp metal sticking up, and then it might wash out, and then someone comes [along] pulling a skier and they get snagged up on it. That's not good. (Segment I, Recreationalist, 2006)

I know they don't let you put concrete in the river anymore. I don't really understand that, and nobody has explained it to me, so I guess I'll have to figure that out. (Segment III, Residentialist, 2006)

I've been thinking about getting some huge landscape rocks and putting them down there along the bank, just on top of the bank. I understand that concrete blocks and concrete riprap are out now because of the lime and all of that other stuff. So, you got to come up with some kind of alternative. (Segment III, Residentialist, 2006)

“Oh, the hoops!”—2012 and 2018

They [the government] kind of made it difficult to stop a problem though. Like we had a place down here... the river washed across and it cut the bank. And we couldn't do anything about putting riprap, or anything, in to keep it from cutting anymore. We had to just leave it. And that is kind of worrisome. And I am not able to fix it. (Segment I, Residentialist, 2012)

If you have to get a permit and wait two months to get it, and the river is starting to flood and take your riprap, you need it now, you don't need it when they decide to do the paperwork... That's why... we got a ten-year maintenance deal now. You know, there's some places that might take ten loads of rock, in other places only five, you know. So, they can just go ahead and do it. (Segment II, Agriculturalist, 2012)

Over here at Bighorn, with that high water, it changed the river, it was cutting on them. And they have a sprinkler, and the wheel with the sprinkler is hanging over the river. So, you come along, and you can tell where it's cutting, and they only let them do like 300 feet or something. So, we took a measure on the river there; they needed 450 feet... So, we tell them, you know, you're going to just waste the riprap. You might as well let them come on around. (Segment II, Agriculturalist, 2018)

I have a real problem with some of the things they require you to get a permit for on the river... for instance, I had a really good friend of mine... they have to put in a new head gate... inside their inlet... And before they could do anything, they had to through four agencies... Now, in my opinion, that's their inlet, they maintain it, they own it... it's not

going to hurt anything. It's not going to kill a fish; it's not going to do anything. All they want to do is fix their head gate. But he said, "We were all ready to start, and then we found out that we had to have all these permits." He said that it took forever. And I'm like, "Well, another way to hold you up, cost you money, time." And it's not necessary. I've done enough work with NRCS, and Soil Conservation Service. And man, the number of permits you have to get now to do anything on the river... from the Army Corps of Engineers on down... they almost overlap... And the really unfortunate part of it, a lot of those people that have those jobs that are in charge of giving out these permits don't have brains enough to pour water out of their shoe, in my opinion. Because they come, and they look, and they... don't know what they're talking about... They haven't done it. They're just in charge of the permit... [And] now, if we want to do any repair work [on our project] ... we've got to get a maze of permits. And one of the other problems is that they make you do it to their specs... And their specs, there again, in my opinion, they're not common sense specs. Because we know what works because ours has stayed all these years. (Segment III, Agriculturalist, 2018)

There's a lot of hoops and whistles you got to do to put anything on the riverbanks, and we had to something right away, so we called the authorities in Miles City... And they said, "Go ahead and put some concrete on it." Because it was going... Trees were going out into our fields and stuff, so on three or four banks we got some concrete riprap. And I didn't like doing that, they don't like doing that on Sarpy Creek. You know, they want it to stay natural, so when we clean up on the creek, if a log fall in the creek or a tree, I'll cut the branches off and I'll pull the log over to the bank and kind of anchor it down, so they really like that. So, they know we are trying to keep it natural. So, they allowed us to put some cement riprap on it to keep it (Segment II, Recreationalist, 2018)

It was a 2-year process to get it all approved and get it underway. And each stone is placed immaculately. Everything has to be done just right in order to pass the certification. (Segment IV, Residentialist, 2018)

I think it's a little harder now than it used to be. I know my uncle had an excavating business, basically, and back in the 50's and 60's people would just call him up and get in the river and put riprap in. I think there's, I'm not familiar with it, but there's a lot more of the process to go through to do that kind of stuff. (Segment IV, Recreationalist, 2018)

Even now just for the ditch company to, in the fall when the water drops way low, just to get a permission through the Corps of Engineers, they can't just go up without the permission and scrape all the gravel and stuff out... So, it's hard... for them to dig anything out ... (Segment IV, Agriculturalist, 2018)

The problem is, I said we worked with the Corps of Engineers, but they also drug their feet for years and years and years to where that 40 or more acres was gone... all because we could not get permitting. They kept dragging their feet, dragging their feet, dragging their feet, so we... turned out over the conservation district because we couldn't get any footing. And they, having dealt with the water issues for a century, they were able to finally get some permitting in place and we got some of the work done and it held this

year... [but] the Army Corps of Engineers... They are the ones that are the big oversight, looking at supposedly the big picture and controlling us little government entities so that we don't do something that is harmful to the river or the environment... The middle ground for me would look like common sense... would go in and we would talk to the people that have lived there on the bank and have been here all these years and do it from a local perspective rather than get the Army Corps of Engineers in and take ten years to do this... if you have to wait for all this red tape – and there is huge red tape in this thing because what you do here, you have to mitigate and pay for down the river what you might affect... Mitigation credits... So, it gets very expensive. It's not just the cost of doing the project. It's the mitigation costs also, which can almost in some cases exceed the costs of the project... Around 7,000 bucks a credit... Yeah, they have a mitigation bank. I don't know where that's at, but... I hope nobody robs it... The state is more the common sense part... A lot of it is tied up with federal stuff... Our permit for repairing our riprap at the other place, that was a state-issued permit... And that's the way it should be. That didn't take years to get done... The local conservation district, they go out and look at it and they got common sense ideas to fix the problem. And they got feet on the ground. Maybe they don't have the years in the educational system, but they've got the experience of it. This isn't the first time they've seen this... They've got some gray hairs... and they know to fix it. But sometimes I think that they feel like their hands are tied and they are not able to get on fast enough to fix it. (Segment IV, Civic Leader, 2018)

Whose Rule?

Experiences with Agencies—2006

I don't think those are things that we have any control over. A lot of this is going to be Corps of Engineers, Lower Yellowstone Irrigation, Fish and Game. It is not going to be our problem... We just don't deal much with the river, unless it is a road issue. The only dealing we have had with the river is this boat ramp and, there, we dealt with Fish, Wildlife and Parks. (Segment I, Civic Leader, 2006)

[We would like to] do some riprap, but we're not allowed to do that... Fish and Game [won't allow it]. (Segment I, Residentialist, 2006)

They fooled with the river...[when] they put the jetties in, and that stuff. You'd think now that they fooled with Mother Nature, somebody should be committed to keep it from washing...They should...[see] to it that it don't wash...If [the jetties] were put there, they should have been maintained...I've had it stuck in the back of my mind, but I don't know who a guy would see [to have it looked into]. The Corps of Engineers? (Segment I, Agriculturalist, 2006)

If you look over the bank [you'll see where] I have to reinforce it because it has sloughed-off into the river... I've actually put a retaining wall behind it to shore it up... Other people have done the same thing...Some people have put big rocks close to the bank to shore it up... I'd be overjoyed if somebody would come in and deal with it in a

more professional manner. I don't know who would be responsible for that. I guess, since it is on my property, it is my deal. (Segment I, Residentialist, 2006)

The most difficult part of getting it done is you go through the Corps of Engineers and then the Fish, Wildlife and Parks, and then the DEQ. I think it ought to be good enough if the Corps said it was needed that would be enough... So many entities... [are] involved and who wants to be in complete control? Maybe [you could] deal with one department. As it is now, you have to go through each and every one of them and it makes a complicated issue more difficult. (Segment II, Agriculturalist, 2006)

The barbs are the answer. Now whether you need blanket riprap or not depends on the conditions. Getting through the Corps of Engineers—that's the tough one.... The Soil Conservation says this is good. Fish and Game is in love with the barbs because it makes some excellent still water for fishing. But then you've got the Corps of Engineers. They would like to do it, too, but they work with the federal government, so they have a problem. (Segment II, Agriculturalist, 2006)

We started [riprapping] when it was under a cost-share [program]. That is no longer available. As a matter of fact, it's frowned upon. You have to get a permit to do it, now. And you have to go through the Fish and Game, the Soil Conservation, and they are the easy ones. (Segment II, Agriculturalist, 2006)

The individual landowners have to take the initiative to go through the permitting process and work with the local Soil Conservation Districts to come up with a remedy and, hopefully, get the permits. (Segment II, Civic Leader, 2006)

Riprap diverts water into the neighbors' land if you don't do it right. That is something you have to be concerned about. You could subject yourself to a lawsuit. That is something the Corps and the local Conservation District should look at. (Segment III, Agriculturalist, 2006)

I want to give the Yellowstone County Conservation District credit because I think, by in large, they are very reasonable. It's just that in many cases they are reluctant to have you do anything to the river. (Segment III, Agriculturalist, 2006)

The only problem we had was the reluctance on the Army Corps of Engineers and the DEQ to get [the weirs] done. It took us two years.... We probably lost 30 acres and an eagle's nest. To me, that is very disappointing. The lack of vision on the part of people that think the river has to be natural and nothing else works.... The length of time and meetings it takes and attitude of, particularly, the DEQ was very difficult. Some of the people in the Corps were very reasonable; some were not that reasonable. The DNRC in town was very good as far as helping us. But their hands are pretty-well tied. They wait for all of the bigger agencies to deal with it. I think they make it so difficult that people just don't want to do it right, frankly. (Segment III, Residentialist, 2006)

Initially I didn't really know what to do and I was looking for advice [on the permit process]. None of those people give you advice, not the Conservation District, not the floodplain people, and not the Corps of Engineers.... I just talked to people. (Segment V, Residentialist, 2006)

All my father-in-law used to do is talk to the [Conservation District] and the Army Corps. They used to design the project for you, but they don't anymore. (Segment V, Agriculturalist, 2006)

When [my project was] washed [away], I was pretty upset because I put in a lot of work, and it cost a terrible amount of money. Along in June one of the agency personnel showed up and said, 'How did that project work out?' I came apart. He said, 'I could have told you that wouldn't work.' I said, 'Why didn't you?' He said [the Army Corps of Engineers] wouldn't let him talk. There was an 'agency difference of opinion.' (Segment V, Agriculturalist, 2006)

Experiences with Agencies—2012 and 2018

And, you know, it all starts of course with the federal and the state governments and what jurisdictions they retain for themselves, etcetera... But the state of Montana... and I think the Lower Yellowstone Conservation Districts and organizations like that are very concerned about the use of the river and trying to keep it from being altered or changed with artificial impairments and things like that. (Segment I, Civic Leader, 2012)

One thing we've been trying to do on the [Conservation District] board, like on the riprap permits and stuff is, before it seemed like it used to take forever to get a response back, we're trying to tell them we want an answer back in 10 or 15 so we can get with it, you know. And that's been helping... [The requests go to] The Fish and Game and then the Bureau, you know. And then on the riprap, I think it was like... I can't remember the guy... [And] I think it is [a better working arrangement now with the different agencies]. When I first got on there was this... state hydrologist, the Bureau, and the Fish and Game hydrologist, and they didn't get along. And one retired. It seems to be going a lot smoother now... But we okayed some projects back then, like for riprap, and they denied them. So then I had to go more to the state level, you know. And we haven't had any of that lately. (Segment II, Agriculturalist, 2012)

Our number one job, as the conservation district... basically what we are is the referee on the Yellowstone River... more times than not, we end up being an advocate for the landowner, and try to keep the peace between the government agencies and the landowner. Now that being said, sometimes we have to step up to the landowner and say, "No, you're in the wrong, and the government agencies are in the right." So, there's a fine line there. But basically, we're the ones that are the referee. We throw the yellow flag when it needs to be thrown... [And] we have a great working relationship with most of the government agencies, Yellowstone County here. I think, uh, for one thing, everybody has got long-term employees that are well established here. And there's not much turnover. So, everybody's found a way to work with each other on stuff.

Everybody values everybody else's opinion, and everybody seems to take it into consideration when they're making their decisions. So, it seems to work pretty good. (Segment III, Agriculturalist, 2018)

I think it's beneficial for me, as a river landowner, to be on [the Conservation District Board]...to help facilitate... When you're a landowner on the river it's not an easy situation. Everybody thinks they can come and play, and all the government agencies want to tell you what you can and can't do. As a landowner that can be very frustrating. I think the biggest frustrating thing for me and for other landowners is how long it takes to go through the process to get a permit. There's so many agencies involved and it just... it's very overwhelming for a landowner to go through that process.... The conservation district is responsible from the inside bank into the river. Anybody that's going to basically touch the water, they have to come to us to get a 310 permit to do any work.... And basically, how that works for us is the Fish and Game, Fish and Wildlife, they're always on the river with their boats doing their thing... And they're awful good to come to us to say, hey, somebody's doing something here... And then we get out our landowner maps and we'll send them a letter saying, hey, we'd like to come look to see what kind of work you're doing. And then we proceed from there.... We've had new landowners come in from out-of-state, had no idea that you couldn't do it. We've got other one's that think, "By God, it's my ground, I'll do whatever I want to do, and I'm going to do it." And we've had some that are fall in between both of those. (Segment III, Agriculturalist, 2018)

It's a hard conversation to have... Because people have lots of dollars invested and when you tell them they can't get in the river and start protecting their asset without going through the proper channels, it gets very tough. And gets very emotional. And sometimes we're [the Conservation District Board] not always very successful at it. (Segment III, Agriculturalist, 2018)

The “Ultimate Arbitrator”: The COE

Talk about the COE—2006

In recent years, on the Yellowstone, it hasn't been quite so bad. [In the past] the water was meandering so bad we had to relocate actual roads. So, then we had to get into the Corps of Engineers, and do the riprapping thing, and all that. I think in the last 20 years we haven't had to deal with much of that, but in the past, it was a major issue. (Segment I, Civic Leader, 2006)

Probably the most important is working with the Corps of Engineers to get a reasonable method of controlling erosion along the river. Every one of these little towns has to have an intake for water. They need some kind of control, guidance, engineering, that sort of thing. Farmers need it. We need more help from those people, to get the Corps of Engineers educated as to what we need, what will work, what's functional. (Segment II, Agriculturalist, 2006)

But, you see, [my losses] all could have been avoided because right at the Yellowstone River Bridge, after the water would go down each year, there was debris and a few rocks, and we would go in with a backhoe and put it back where it was....Then the government made a practice where you couldn't remove that again, so the river swung, and just ate it out.... We should go back to the Army Corps of Engineers, and I should be reimbursed for that rock jetty, because, when I bought the property, that is supposed to be taken care of. And it's very expensive.... Everything is so expensive.... I don't plan to do anything. I don't have a great deal of faith in the Corps of Engineers. I think they should come out and justify what they did. (Segment IV, Agriculturalist, 2006)

Well, if you've violated the law, it doesn't take... [the Corps of Engineers] too long to get here. If you really need them for a permit, sometimes it takes forever. (Segment IV, Civic Leader, 2006)

To some degree the Corps has been maybe too quick to grant the permits for hard armoring without...necessarily educating landowners that there are alternatives. And I'd like to see that. There are certainly a lot of soft armoring techniques that are quite feasible and, in the long run, have lower maintenance [costs]. I think a lot of landowners, if they were aware of those options, might choose those [soft] options.... I think we need to look at alternatives. (Segment V, Civic Leader, 2006)

The Corps of Engineers...is the ultimate arbitrator on the Yellowstone.... When we brought people here from Omaha and floated them down the river, [someone said] 'Oh my God, there are big boulders in the river.' Most of the rivers in Omaha have a sand bar. It doesn't take very long to see where poor decisions get made. They had no idea. ...It is based on old science ideas, and it is difficult to get them to change...They went, 'Oh when we talk about the Yellowstone, we need to use different criteria.' (Segment V, Recreationalist, 2006)

Talk about the COE—2012

And we had 3 years ago, no it's been longer than that, but the last high water we had, we had a washout down below the dike. The river changed channels and came around our corner and cut a piece out down below the fairgrounds. And so, the Corps and them said we'll fix that right now, and they did. They came in with riprap and put that dike back, formed a new dike right in there where that had washed a little piece, where the river had curved into it. (Segment II, Residentialist, 2012)

[I've seen people stabilize the banks with] boulders, lots of boulders... It seems like [it works] ... It deflects the water, the pressure away so it doesn't erode the soil... [But] there have only been a few places I have noticed that that is what they have done... I don't think they can do it a lot. Because the Army Corps of Engineers, I believe, has the say of what goes on the banks. (Segment IV, Civic Leader, 2012)

I'm not really clear on what the SAMP [Special Area Management Plan] intended to do... I know it is supposed to be guidance document for how alterations are done. Beyond that, I haven't read it. I don't know whether it changes anything or just administratively solidifies what is already in place in terms of practice. So, I don't know whether any changes resulted... I believe it came from the Corps. (Segment V, Civic Leader, 2012)

Last year...was... a nice acid test... We kind of went through reaction to the flooding of '96 and '97—things like the Governor's Task Force, and... we worked on a lot of those issues.... Part of the Task Force thing that fell out of that was the Special Area Management Plan. And I think we're now just sort of in the phase... of seeing how the SAMP [Special Area Management Plan] is going to be applied, and whether people can work with it ... whether the various participants are happy with the results... Those that didn't want to see regulation on the river... they saw the SAMP as something that was going to prevent any kind of development, any kind of work. From the ranching community, I think the worry was that we are not going to be able to do anything along the riverbank now.... I found it kind of oddly amusing that... the environmental community looked at it exactly the opposite... that the SAMP is going to rubber stamp every bit of development within the area of the plan. So, I think, like in most cases, the sky is falling attitude from either side of the fence is not necessarily what's going to happen. But I think from everything I've seen so far... I've heard people say... that they're still worried that the SAMP is going to create problems... again, depending on which side of the fence they are looking. But I think we're just now sort of in that phase where it's going to be a while to see how the ag community deals with it, you know, realtors and people wanting to build houses and seeing where the whole thing plays out. And I don't have much of a feel yet for what people are thinking. (Segment V, Recreationalist, 2012)

Talk about the COE—2018

They're a time-grabber. And... I understand...the river does not have a voice. But at one point or another, they have to recognize that there are 6,000 voices here that need consideration, and not just through the environmental aspect. I became very frustrated with the inability of myself to be able to communicate that to them. I thought it was pretty plain. They, on the other hand, did not see it as plain [laughs]... You're picking on a scab here... because when we had the railroad come in and put in that bridge... they failed, in my mind's estimate, to follow all the guidelines that were required for their endeavor.... When we [the City of Laurel] went into the river... they were just making it more difficult.... The railroad, by gosh, the railroad's going to do what the railroad's going to do... It was not apples to apples... I would hope that... somewhere along line, people would recognize that it should have been apples to apples—because we were both in the water. Don't make any difference if that boot that goes in the water is in the foot of a municipality or if it's in the foot of a multi-billionaire industry. So, that was my concern... It's very discouraging. (Segment III, Civic Leader, 2018)

It seems like in this last year it's changed a bunch. It seems like the Corps has a lot more to say. The floodplain people in Livingston, who are all from out-of-state, pretty much control what's going to go on.... It seemed like they messed a lot with the interpretation of the vocabulary. So, without actually changing it, they changed the intent and the meaning of the words, which was really difficult for us.... It's not as local anymore. And you know, local people a lot of times have historical context. Other people that are applying science... bring this great big global [perspective] rather than looking at what this particular ecosystem is.... They're trying to blanket it.... You can't take care of your structure anymore. You're going to have to go through this bigger permitting process.... It's really hard. (Segment V, Agriculturalist, 2018)

I know the Corps has gotten more difficult recently, because a friend... they have a fair amount of river property, and... it's taken stuff out, and the Corps wouldn't give them a permit. However, you can stockpile a whole bunch of rocks so on emergencies you can put it in. Now that seems really stupid to me, but that's sort of what the new deal is... In an emergency if it's eroding, you can start dumping a lot of rock in and it'll end up all over the place... I just heard that a little bit ago. (Segment V, Recreationalist, 2018)

A Real Good Relationship with the COE

[Forsyth] is built around the river, and the city is protected by a dike... it's nice to have the dike. We have a working relationship with the Corps of Engineers to maintain the city's responsibility for the dike. (Segment II, Civic Leader, 2006)

We see maintenance on [the dike] every few years. If there's ever a spot that isn't very strong, you see them dumping gravel over the bank.... So, it seems to be maintained very well. (Segment II, Residentialist, 2006)

Right now, the city [of Miles City] is rebuilding those levees down there, and from what I can tell they are doing a pretty nice job of it... I see them every day hauling in concrete and stuff and building the levees down there. (Segment II, Residentialist, 2012)

The sentiment of a lot of the population in Miles City believe that... the Corps of Engineers of course are the ones that... always get the brunt of everything. And they are not the bad guy here, I can tell you that right now. The Corps of Engineers is wonderful group of people and, you know, they have worked very diligently and very well with the city of Miles City... I would like to see FEMA and the Corps of Engineers do a little more give and take, but I also understand that... they have guidelines, and they have their policies—they have to conform to and abide by those. So, we are definitely in for a long process. (Segment II, Civic Leader, 2018)

We're 100% confident in the levee... We're involved in the SWIF [System Wide Improvement Framework] program... to make sure we meet the standards set by Corps of Engineers right now... But the Corps has not said yet, "You get that stuff off that dike by July 1st, 2020," but we're taking the initiative... We've had a real good relationship with the Corps of Engineers. They come down every year and inspect and tell us where

we have weaknesses, what we need to do... it's been a very good relationship and we do what they ask us to do (Segment II, Civic Leader, 2018)

It's controlled pretty much by the soil conservation people in the government. You just can't go in there and start doing your own thing... Everything has to have a plan and be approved by them. They've been really good to work with out of Big Timber, really good... You can't go down and start dumping a bunch of rocks in without approval from the Corps of Engineers or whatever... When the water got so high it actually got underneath the wall out here, and the wall was slipping away... I called our neighbor across the road... and I said, "We need help." He was down here within two hours with truckloads of rocks, kept dumping them... I called Big Timber, the Corps there, and they were so good. I described what was going on and they said, "Do what you have to do." And they followed up with a letter that I kept in the files that they'd approved it. And then they came down a few times just to check, and I assured them that we're not going to do anything that's going to hurt anything. We're just trying to protect our house and property here. So, they were really good to work with. (Segment IV, Residentialist, 2018)

We needed to do some emergency work, placing riprap in that area. And we are very lucky to have a good relationship with, first of all, the state, but then getting the Corps of Engineers on board. In a matter of a phone call, we were given authorization to do some repair work... And since, it's held... If we ever get to that point where say it's a common occurrence that is has to be repaired, then I think we'd go to the Corps and say, "Okay, what do we need to do with this?" (Segment V, Civic Leader, 2018)

I think they're doing a good job. You know, they're not letting people throw car bodies in there anymore... They most always have a plan [laughs] and look at it. And they also look to see how what they do over here, is it going to affect the river on the other side then? ... I think they're doing a good job managing it. (Segment V, Residentialist, 2018)

Suggestions for Management

Suggestions—2006

You have to have a benchmark.... [Then] you can look and see if something is having a devastating effect or no real effect. This mapping is the first step. You can't make these decisions without it.... [We need to know] what are the cumulative effects, as opposed to...just hot air in the wind... You [need] a firm basis to make your decision. That way they can make intelligent decisions. That is the major role [for management]. Eventually they will be able to make decisions because they know what has happened and they will have evidence to support those decisions. (Segment III, Agriculturalist, 2006)

The pressures from industry, agriculture, and urban areas are not benign on the quality of the Yellowstone River. Also, we're beginning to channelize the river and drastically affect the biota, the quality of the water, the quality of the scenery, and the quality of the recreation potential. It has limited capacity to supply all of these things.... It's over-adjudicated and it's under-regulated, but there's not a conservation strategy.... There's a

direct tie [between] how well we manage all these activities and the health of the river. (Segment III, Recreationalist, 2006)

When the river is flooding and eroding land it is trying to relieve itself. If you tighten up down here, someone downstream is going to get it. It is almost impossible to get permission to riprap. [Riprap] can definitely have an effect downstream. It re-energizes the river. You definitely have to take a look at that.... I'd be very concerned if I was a landowner downstream and somebody put in some riprap. They should definitely have a say, too, and there should be some remediation, if [those downstream] lose land as a result of riprap upstream. (Segment IV, Recreationalist, 2006)

I think it's a good thing that it's hard to get the permits, but I think they just have to start addressing some different ideas on how to control the river during high water and how to keep a lot of the water in Montana instead of letting it go on down to the Mississippi to support barge traffic. (Segment IV, Agriculturalist, 2006)

I think the river is threatened. We have rules, but we are only [a few] eyes up and down the valley. If it weren't for a lot of caring people, and a lot of snitches... [we couldn't do our job] We need to update our regulations. We need to look at them and revisit them—and make more people mad at us. (Segment V, Civic Leader, 2006)

I think at some point the government is going to have to be willing to step in and help the landowners along the river. That land has value, but it has value for many different possibilities, not the least of which is wetlands. The floodplain is what lets the river spread out during these floods. I think that there is going to have to be some programs where the landowners get some compensation [if they] allow the river to go where it wants to.... And it has to be in the same context as if they are raising a crop. It has to be a long-term agreement [with] the landowner, be it a rancher or a farmer or someone who bought in for aesthetic purposes. They need to be compensated. I don't know any other way to do it. The local landowners...don't have the means or the money to just donate that. That is what they are being asked to do now. That isn't right. (Segment V, Civic Leader, 2006)

The public, and myself included, we need to have some available information.... We [weren't] really good stewards when we moved here. We've done some rock work along our bank, and there wasn't anyone there [to advise us] unless we could have paid for professionals....But at the time we couldn't afford it....If there's some kind of grants that may be available so you can hire a professional—if those professionals really have the answer—that's a question...I have. (Segment V, Residentialist, 2006)

When we first moved here and we knew we had problems with our banks just because of, well, poor management. So, we called up several different professionals.... We wanted a conversation about what would be the best thing for us and the river. And we didn't get a lot of good information. In fact, very little. And I think that's one of the things that is missing....There's not a lot of people that can afford a major study on how to protect their lands....Somehow we have to have that information available and be willing to

work with people on the river so they don't do something that's going to damage someone else, or damage the river, or straighten the river....This is a meandering river. It's great. It should stay that way. (Segment V, Residentialist, 2006)

I think you need to try your best to go way out of your way to make sure the public is brought into the process as much as possible. (Segment V, Recreationalist, 2006)

Suggestions—2018

I think if you can educate people and get them to do it, you're going to have less government interference. But most of the time, the idea is, 'this is my land and I'll damn well do what I want with it.' The fact that they are taking something that is shared by all of us, which is the river, gives government the right of oversight, I believe. If it was just one man and one pond that would be fine, or one landowner and one river in his property, it'd be different. But it's a river that's shared by all of us, by the whole country. (Segment III, Civic Leader, 2018)

Truthfully, if nobody ever would have put riprap in the river, it would be a whole different thing. But we can't go back there. Of course, these spring creeks at different times were part of the river. We all know that... [But] people started doing things like putting cars or hauling rock in because they didn't want [erosion] to take these spring creeks.... Everybody that's lived along the river has tried to keep their land intact by the river, for sure.... As a society, and as a government, you look back at what people did, and you want to judge, and criticize, and say, "We're not going to do anything else now because they did that wrong." But you know, that's already been done, so it just seems like wasting a lot of time worrying. What can you do now? (Segment V, Agriculturalist, 2018)

If you're being flooded, you have the issue where you can claim emergency and just go do it. But if you're not being flooded and you ask for permission to do it, it's a long process... So, I'm not saying everybody's doing it, but some people know that, so they just wait for the water to get up... So, it seems like there could be something more done to make that go away; maybe the permit process would be easier or faster. (Segment V, Civic Leader, 2018)

I live ten feet from the banks of the Yellowstone. When I did a construction project on my house... of course the bank wanted... to know what its risks were like flooding. If you look at the FEMA map, I'm on the floodplain. They're like ah, we're not going to finance this. So... I look at the FEMA floodplain map in Paradise Valley... and guess where the FEMA map draws [its line?] It comes down to Livingston along the Yellowstone River on the west side. Guess what structure it hits and then there's square lines that go around and then back to the river saying this is not part of the floodplain. Guess what building it is.... [It is] Park High and the middle school. Why? Because you need flood insurance. So, I'm like okay, this is horse shit... So, I called, and I go okay, I'm calling your B.S. What do I need to do? ... And they didn't even actually have to come out. They just kind of went, "Oh yeah, you're not in the floodplain." We need

the government to do its job, right? And everybody needs to be treated equally so at least when we're talking about floods, we know what we're talking about. (Segment V, Recreationist, 2018)

Section 10. Analysis of 15 Recurring Participants

Having gathered data during three different field seasons, spanning 12 years, we had the opportunity to explore these data via an additional mode of analysis. Fifteen individuals participated in the project in each of the field seasons: 2006, 2012, and 2018. We refer to these participants as the 15 Recurring Participants (RPs), and we approached their interview data as a unique sub-set of the 12-year effort as a longitudinal panel interview study.

Although we used the same interview protocol during each field season, the open-ended questions allowed participants to shape the conversations in light of recent events. The findings echo and reinforce trends identified in the above sections. Here, though, an important additional insight is disclosed. Namely, when place-based/experience-based stories anchor individuals' understanding of river processes and management, those stories can function to hinder or enhance the individual's ability to incorporate new information into their personal discourse.

Fifteen Recurring Participants

The group of RPs included six agriculturalists, three local civic leaders, 3 recreationalists, and 3 residentialists, and each of the Geographic Segments was represented by 2-4 individuals (see Table 7).

Table 7. Longitudinal Analysis Participation Table by Segment & Interest Group

	<u>Seg. 1</u>	<u>Seg. 2</u>	<u>Seg. 3</u>	<u>Seg. 4</u>	<u>Seg. 5</u>	<u>Interest Group Total</u>
Agriculturalist:	1	2		2	1	6
Civic Leader:			2		1	3
Recreationalist:		1	1		1	3
Residentialist:	1			1	1	3
Segment Total:	2	3	3	3	4	15

Analytical Foci and Approach

Our approach was to examine the degree to which the 15 RPs' comments have changed (or not) over time regarding flooding, erosion, and the oversight of bank stabilization projects. We analyzed the 45 interview transcripts for analysis (15 individuals x 3 field seasons) for our foci identified and cataloged within each transcript. The sorted data were then examined for patterns of similarity and/or dissimilarity, within and across the field seasons. As a longitudinal data set, the interviews with 15 RPs would allow us to evaluate the persistence of ideas among valley residents. Our findings are explained below.

Findings

Floods as Anchoring Events

The RPs described specific flood events and annual summer flooding in the interviews using place-specific experiences. Often one or two flood events were identified as important experiences that allowed the RP to orient their understandings of event magnitude. Over field seasons, these specific events were referred to time and time again. Thus, we interpret them as *anchoring events*, ones that function as centerpieces in individuals' descriptions of flooding. The anchoring events are place-specific, often to one's property or town and specific to the RPs' role in their communities (e.g., mayor, farmer, field guide, or home owner) thus, they vary in character. For instance, the floods of 1996 and 1997 anchored descriptions of flooding for people in the island at Livingston quite differently than for others impacted by those same floods.

Participant comments about flooding ranged from ambivalence to a sustained defiance to acquiescence towards flood events. The most outspoken RPs were those who expressed a lasting defiance to flooding. This group was largely made up of agriculturalists who farmed land along the river. For riverfront farmers, threat of flooding and impacts of loss of lands to erosion and channel jumping (avulsion) was an ever-present worry. RPs described with great detail the damages they experienced due to June (June Rise) and ice jam floods and the hardships of trying to manage their property and livelihoods next to a large dynamic river. As beneficial as the waters are for the farmers' irrigation needs, the river can take productive ground. For those who work the lands closest to the river, these were commonly voiced perspectives.

For example, a third-generation farmer characterized living on the river as, "a detriment, not an asset. It's just a big pain in the ass to me...every spring, right north of here, it will take 10-feet deep—clear to the gravel" (RP-B, Agriculturalist, Segment II, 2006). This same sentiment was expressed in all three field seasons, and it helped the farmer explain his losses that impact productivity:

A lot of the work that was done [on this farm] 30, 40, 50 years ago is now down the river. You know, we lost a lot of production.... We had trouble [with the 2011 flood]. We couldn't use any of our pasture until probably October. So, it was really a trying year. As long as I've lived here, I've never seen that much water go down that river in the flood channels and over the fields like it had that year, I've never seen it like that. I mean it was just roaring through there. (RP-B, Agriculturalist, Segment II, 2012)

The floods and the erosion had caused him to discuss with his brother the idea of selling the farm. He said, "My brother doesn't want to sell, and I do. So, I always tell him, 'Well, your part of the farm *was* right there, it went down the river.' [laughs]." (RP-B, Agriculturalist, Segment II, 2018).

Another agriculturalist couple echoed similar sentiments, "Sometimes, you glorify it and sometimes you think, 'Boy, it is a monster.' You learn to accept what it does. If you worry about it, you can't do anything; especially when it is really doing stuff, everybody is helpless" (RP-D,

Agriculturalist, Segment IV, 2006). Throughout the field seasons this sentiment was echoed, again and again. In 2012 he said, “while you live on the river, you got to fight it” (RP-D, Agriculturalist, Segment IV, 2012), and in 2018 he said, “I think you just have to accept the fact the bank will just keep eroding away” (RP-D, Agriculturalist, Segment IV, 2018).

Two other agriculturalists described their experiences of the 1996 and 1997 floods in strikingly similar terms when comparing comments from 2006 and 2012. In one case, the agriculturalist explained that ice jams loosened rocks and subsequently washed out their jetties. In 2006, this anchoring event functioned to help describe the river. In 2012, this same story was prompted after being asked about what type of bank stabilization they have used (see Box 1).

Box 1. Descriptions of Floods: RP-D, Agriculturalist, Segment IV	
2006	2012
“We had those ice jams and they kind of jarred the rocks loose and then, when the flood came, it wiped the jetty out.”	“The winter just before the 500-year flood, it loosened that remaining jetty up that winter with that big ice jam, moved the rocks. Then that spring that water came up real high, and it washed it out.”

Another agriculturalist described how flooding “isolated” them from their “bottom land property” in both 2006 and 2012. Interestingly, in 2012, the story included more details, perhaps indicating that as an anchoring event it had gained importance or that the opportunity to explain the event was viewed as more important than in 2006 (see Box 2).

Box 2. Descriptions of Floods: RP-F, Agriculturalist, Segment V	
2006	2012
“In ’96 we washed out big time here. It came through here and created a channel through me and so I was isolated from my bottom land property.”	“In 1996 the river got extremely high. I would say 75% of the Yellowstone River was running into Spring Creek. And it cut me off from about three or four hundred acres of property. I put in root wads along the bank, and we planted willows, and we planted grass, and I did a tremendous amount of work that cost near three-quarters of a million dollars to do it. Then ‘97 came along, and we had another high event, and I lost the whole thing.”

A smaller group of RPs described flooding as a natural process that was important to maintaining a healthy river. These RPs were generally engaged in livelihoods that were less dependent on river-front lands. Their descriptions were broader in scope, referencing more system-wide notions of river health. These RPs were sometimes concerned that too much interference with the river’s natural processes might lead to unfortunate consequences.

For instance, a civic leader who moved to the area after the significant flood events of 1996 and 1997 described regular floods as a “renewal of the ecosystem,” something “desirable.” Another comment was, “This river system has been fairly resilient, I think there is a fair amount of seasonal rehabilitation that the river does for itself, but that’s not unlimited in terms of capability, and it’s hard to know what the limits are without bumping up against them (RP-A, Civic Leader, Segment V, 2006). In 2018, the comment was, “I don’t know whether my attitude affects what the river’s doing, but generally I see it [flooding] favorably” (RP-A, Civic Leader, Segment V, 2018).

A self-proclaimed “river person,” whose family has lived, farmed, and managed an irrigation company for generations, offered similar comments in 2006 and 2012 regarding expectations. In 2006, RP-E referred to system-wide river health initiatives. In 2012, RP-E expressed a similar sentiment in response to a question regarding “damages” from flooding. Within different contexts, the participant expressed a similar priority (see Box 3).

Box 3. Descriptions of Floods RP-E, Agriculturalist, Segment II	
2006	2012
“My whole theory about the river is that we have got to have a new vision on what we expect of our rivers. I want to prove to the world that we can have the irrigated agriculture, but we can also have our rivers and pretty much leave them intact.”	“I hate to refer to something that happens naturally, from time to time, as damage. I kind of look at it the other way: we’re here and we’re kind of more or less the damage; we’re the newcomers, so it [the river] needs to be able to do kind of what it wants once in a while, and I have always felt like that.”

The field season of 2012 allowed RPs to discuss the floods of 2011. Descriptions of the flood event varied according to Geographic Segment, but the most recent flood was often explained in comparative terms. Those in Segment II, RPs described the 2011 flood as: “a lot higher and higher a lot longer” (RP-C, Recreationalists, Segment II, 2012), “I’ve never seen it [the river] like that” (RP-B, Agriculturalist, Segment II, 2012), and the river was “brim-full” (RP-E, Agriculturalist, Segment II, 2012). RPs from other Geographic Segments discussed the 2011 flood in less detail. A possible explanation was shared by a Civic Leader in Segment V when he explained that “with the ’96-’97 floods the channel morphology changed so much that [the river channel] has more capacity for water now. So, I suspect we had something close to record flood volume, but we didn’t have floods” (RP-A, Civic Leader, Segment V, 2012).

The RPs, especially ones that owned land on the riverbanks, often connected flooding events with erosion of riverbanks. They explained dramatic erosion and avulsion events through detailed place-specific accounts, often providing specific measurements and timelines. For instance, a Residentialist described losing “probably 80 acres, or maybe more,” since around 1974 (RP-J, Residentialist, Segment I, 2006). Another Residentialist described losing “100 feet of lawn in ‘96” (RP-M, Residentialist, Segment V, 2006). One agriculturalist described dramatic avulsion changes: “this island wasn’t even here 25 years ago” (RP-N, Agriculturalists, Segment I, 2018). Another agriculturist described major avulsion events in 1996 and 1997 as occurring at

“the rate of three or four feet a day, sometimes more. Hard to stop it” (RP-D, Agriculturalist, Segment IV, 2012).

For one agriculturalist, his personal philosophy seemed to mature over the years from ‘you always fight the river,’ to ‘fascinating,’ to ‘a necessary thing.’ (see Box 4).

Box 4. Description of River Power RP-D, Agriculturalists, Segment IV		
2006	2012	2018
“Somebody told me, if you don’t like losing land and getting flooded, you gotta go get up in the hills and buy a dryland place. You always fight the river a certain amount”	“We all know it’s got the power. If you don’t cry about it and nobody loses their life over it, I think it’s kind of fascinating.”	“I really don’t think you can stop the river through our section here. It’s a necessary thing.”

Comments on Management

Our analysis revealed little change in participant priorities and narratives used to describe flooding and its management. For example, agriculturalists spoke of flood management as their “biggest problem” (RP-B, Agriculturalist, Segment IV, 2006) or “biggest monster” (RP-B, Agriculturalist, Segment IV, 2012) and then provided suggestions on how to improve management. The RPs often described the solution to flood management as more awareness and education, “if they could drive around and see, well that is what happened to so and so” (RP-F, Agriculturalist, Segment V, 2012). Other suggestions included better technology (i.e., dams, levees, new engineering solutions, etc.) or development set-back laws—laws prohibiting development within a certain distance of the river. Several RPs discussed set-backs or specifically dams as the “only way we would have fixed control here” yet concluded that these were a politically unattainable solution “that isn’t going to happen” (RP-D, Agriculturalist, Segment IV, 2006).

One agriculturalist echoed the same sentiment in all three field seasons with little to no change from 2006 to 2012, both times suggesting poor financial management on a federal level was a problem (see Box 5).

Box 5. Descriptions of Management RP-B, Agriculturalist, Segment II	
2006	2012
“The biggest monster for soil erosion is the river. The reason they don’t touch it is your environmentalists and it is so costly. It takes a lot of money to riprap a river. We poop that away every day in Iraq. We don’t take care of our own country and our own people. Just like this river.”	“I guess what really irritates me is we’ve spent, I think it was like 880 billion in Iraq, 330 billion in Afghanistan, and we’re going to get rid of these satellite FSA offices. To me, it’s just totally ludicrous. You know, it’s really poor management at the top.”

In 2018, the participant discussed the topic in a similar sentiment, but this time offered technology as a solution, “But you know, we have so much technology, why can’t we do a better job than what we’re doing? That’s what I’m saying” (RP-B, Agriculturalist, Segment II, 2018).

A civic leader described flood management as a priority in all three field seasons, even though the context for the comments was slightly different. In 2006, the comments came after discussing a study. In 2012, the comments occurred when the RP was discussing the need to balance interests. In 2018, the comments were part of a discussion about how to improve river management (see Box 6).

Box 6. Descriptions of Management RP-A, Civic Leader, Segment V		
2006	2012	2018
“So, I think we’re going to have to have some kind-of engineering solution, and I’d really like to see it involve, in a perfect world, some kind of service set-back, designated flood-way, flood-plain area.”	“Most of that obviously has to happen at the county level. You know, in terms of setbacks and everything else. Again, looking back, ideally, I would have put setbacks in place in 1920, but it is hard to do it now.”	“We try to create awareness and incentives on the part of people who would otherwise make less than informed development decisions, both with respect to structure siting, construction materials design, those kinds of things.”

Another agriculturalist indicated he had been directly involved in the construction of a diversion dam. He expressed grave concerns for river management as it related to fisheries and system-wide river health (see Box 7).

Box 7. Descriptions of Management RP-E, Agriculturalist, Segment II		
2006	2012	2018
“We absolutely need to keep the rivers whole and complete as we can. We can have the irrigated agriculture, but we can also have our rivers and pretty much leave them intact. We don’t need to de-water them to death – it’s pointless.”	“You know, and we got to take care of this place the best we can or we’re going to spin ourselves right out of here, you know? When we’re in the right place to do something, we take a hold of it and do it. It’s just that flat responsibility to make the world a better place.”	“I don’t understand why there isn’t an outcry against irrigation companies that entrain fish. Hell, that Intake is such a travesty. People fish in the canal down there. It’s like, for heaven’s sake! How the river even keeps a viable fish population at all in light of what that inlet has done to it.”

Riprap is commonly used to combat erosion along the Yellowstone River, and several RPs had personal experiences with the bank stabilization permitting processes. These RPs explained that getting permission to begin the process was difficult, and some stated that the managing agencies would not let riprap projects move forward. One said, “We possibly could be able to do some

riprap, but we're not allowed" (RP-J, Residentialist, Segment I, 2006). Another recalled a discussion where he was told he could not use riprap and he challenged the decision in these terms: "Are saying you shouldn't riprap. This is my home" (RP-M, Residentialist, Segment V, 2006). A recreationalist described the permitting process as, "a lot of hoops and whistles you got to do to put anything on the riverbanks" because... [the agencies] want it to stay natural... They are trying to keep it natural" (RP-C, Recreationalist, Segment II, 2018).

Some RPs told stories of failed bank stabilization projects. An agriculturalist described his despair in these terms: "When I washed out, I was pretty upset because I put a lot of work and it cost a terrible amount of money; it was devastating" (RP-F, Agricultural, Segment V, 2006). In this case, there was added insult when an "agency" person said, "I could have told you it wouldn't work" (RP-F, Agriculturalist, Segment V, 2006). Also in 2006, another agriculturalist explained the futility of stabilization projects. He told a long story about four jetties, put in by the previous owners of their land, three of which only lasted two years. Both agriculturalists repeated these stories in 2012, with the second concluding: "Anything that they ever put in to protect [the bank] is all gone" (RP-D, Agriculturalists, Segment IV, 2012)

Over the 12-year span of the project, the costs associated with bank stabilization projects remained a matter of concern to agriculturalists and residentialists (see Box 8).

Box 8. Expensiveness of Stabilization Projects		
2006	2012	2018
"I couldn't grow enough crops to offset it, I wish I could, but it doesn't work that way." (RP-D, Agriculturalist, Segment II)	"It's cheaper to buy another farm than cost of riprapping" (RP-B, Agriculturalist, Segment II)	"Even if the government would pay 80%, at our age, it would never pay-out" (RP-D, Agriculturalist, Segment II).

RPs discussed the maintenance issues. The majority expressed these concerns with ambivalence. For instance, one Residentialist explained, "You have to decide if you want to spend the money to fix it or take what comes" (RP-M, Residentialist, Segment V, 2006). Similarly, an agriculturalist described the ongoing task of repair: "I have to do yearly maintenance... I have been working off of that premise that I have to maintain what I have got" (RP-F, Agriculturalist, Segment V, 2012).

At the heart of local frustrations is a tension between the rights of private property owners and the need for agencies to protect river health. Several recreationalists and civic leaders commented on these potentially conflicting interests, especially if setbacks for development are under consideration. In 2006, a civic leader explained, "Politically, there's a culture of property rights and courts. The County Commission is certainly faced with a difficult balancing act in making decisions regarding things like setbacks" (RP-A, Civic Leader, Segment V, 2006).

Some were more defiant about the bank stabilization permitting process, especially agriculturalists, who experienced events that require immediate action. One agriculturalist

explained his frustrations in 2012 and 2018. However, it is noticeable that in 2018 his frustrations had shifted toward procedural concerns (see Box 9).

Box 9. Can't Wait for the Paperwork to Get Done RP-B, Agriculturalist, Segment II	
2012	2018
“If you have to get a permit, and wait two months to get it, and the river is starting to flood, you need [the permit] now. You don't need it when they decide to do the paperwork.”	“We wrote and told them, ‘If you don't let us know within a month, it's an automatic go-ahead.’ And we've sure been working better.”

Many agriculturalists expressed they want management to leave them alone: “They ought to let you go out there in August, when there is not water running by, and do what you want” (RP-N, Agriculturalist, Segment I, 2006). Another agriculturalist claimed, “All I wanted to do is ranch and do my thing. Private property needs to be protected. I think that somewhere along the line people have to come first. It's the people's river.... [And] I can't understand how allowing banks to erode and cut add anything valuable to the river” (RP-F, Agriculturalist, Segment V, 2006).

Again, anchoring events can play an important role in these narratives. Consider the next examples, comments from an agriculturalist in 2006 and 2012 (see Box 10).

Box 10. Erosion & Management RP-B, Agriculturalist, Segment II	
2006	2018
“We used to have a two-story house down there and six acres and a set of corrals with a well. It is all gone. Like Al Gore says, we will be importing all of our food, anyway. Like the potato famine in Ireland. Those people have learned to protect their farmers. If this country has a problem, they throw money at it and that may not be the best answer.”	“To me we're not being represented. It's like, ‘Oh well, so what if half of your farm did go down the river? Tough smash. You knew that when you had it’ Well, we're the third generation, and there used to be a two-story house down there with six acres of hay on the other side of it, and that house has been gone forever.”

In contrast, a recreationalist discussed downstream effects and imagined that his neighbors could come to an agreement concerning a best course of action: “From my own personal experience [of] seeing where some of the projects were done and where the impacts were the greatest, I think some people would accept the fact that there is a sort of bowling pin effect” (RP-H, Recreationalist, Segment V, 2006). However, by 2012, the recreationalist seemed less hopeful that understandings, alone, would lead to agreements: “It's reactionary in every case. [One side says] riprap's going to destroy the river. [The other side says] riprap is going to save my ranch” (RP-H, Recreationalist, Segment V, 2012). He, still wanted the river protected, but he had a much more complex suggestion for moving forward:

Our best shot is to do as little tinkering with the river as we can, and to try to make it easier for landowners to face the reality that some of their land is going to be taken

away”....[We should do two things.] One, see that the finest engineering is done to mitigate as much of the impact of the project as possible. Two, compensate our landowners for the damage that they’re going to do because of the project” (RP-I, Recreationalist, Segment III, 2012).

Those concerned with system-wide health over private property rights still expressed a need for bank stabilization in very specific cases, “There’s some places where you do need to do it, but where it takes out edges of fields and things like that, I think that just puts nutrients back in the river and makes it a good river” (RP-C, Recreationalist, Segment II, 2012). Others also suggested using natural alternatives rather than hard armoring: A civic leader explained it was better when landowners were “helping Mother Nature along by planting shrubs and trees along the river” (RP-L, Civic Leader, Segment III, 2018). Agriculturalists and residentialists found these solutions acceptable, too: “Hopefully, you’d come to the realization that you should give the river some room so that when it comes it’s day in June it has someplace to go” (RP-E, Agriculturalist, Segment II, 2006). A Residentialist put it this way, “Common sense says you should not build right on the riverbank because rivers do move” (RP-K, Residentialist, Segment IV, 2012).

Those concerned with system-wide health often cautioned against bank stabilization for the downstream effects: “Every time there is a bank stabilization project, it pushes problems downstream. If I were king, I would change how we do bank stabilization” (RP-A, Civic Leader, Segment V, 2012). These RPs often expressed that there should be more responsibility placed on project owners stating bank stabilization projects, “have unintended consequences downstream which he’s not responsible for—he should be.... [I know] a landowner who was more willing to deal with damage on his own property rather than say that the [other] guy had to be responsible for what he had done, because that meant he would be next. That thinking scares me” (RP-H, Recreationalist, Segment V, 2006).

Overall, RPs from all sides expressed a need for improved management efforts. They offered several suggestions: “Maybe it is education” (RP-K, Residentialist, Segment IV, 2012), “We need to use our best technology to look at the cumulative effects of these impacts” (RP-I, Recreationalist, Segment III, 2012), and “We had seen a lot of bank stabilization projects without a lot of planning, [and] it wasn’t clear how detrimental that would be to the fishing community” (RP-H, Recreationalist, Segment V, 2006). One agriculturalist explained the need for landowners to think much more carefully about their projects: “Most of the riprap projects have been done wrong because people haven’t taken the time to assess ‘What am I doing?,’ ‘What do I want this to look like?,’ and ‘What are the true reasons I am doing this?’” (RP-E, Agriculturalist, Segment II, 2006).

Discussion of the Longitudinal Data Set

Evidence from longitudinal data provided by the 15 RPs supports the findings above and provides an added insight about the value of these data and this study approach for management and planning. Not only are the stories that people tell important as a means to track diverse understandings, concerns, and issues that circulate among the people of the valley, these same

stories are important as personal anchors that function to define individuals' understandings of how the river works, what projects are best, how rights are framed, and the degree to which agencies are valued as managerial entities.

The evidence in this section illustrates that because the stories are place-based and experience-based, they may not obviously dovetail with scientific or abstract information. The repeated use of anchoring stories within RPs' descriptions of physical processes and river management can likely function as factors contributing to individuals' resistance to new ways of thinking. The persistence of stories and explanatory narratives regarding oils spills is explained elsewhere (Emerson, Hall and Gilbertz, 2021). However, trace evidence regarding "channel migration" and "climate change" suggests that the stories are, at times, adapted to incorporate new information or new vocabularies. Thus, they also represent opportunities for incorporating new information and ways of thinking. When new information is incorporated into familiar stories, we posit the new information will likely have staying power.

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Appendix: Interview Protocols

Example interview protocols for each field season are found below. These examples were used with participants in the “agricultural” interest group. Minor adaptations were made for participants from other groups.

2006 Protocol-Agricultural Participant

1. How many years have you been in operation here?
 - a. Do you live here full time?
 - b. IF NOT: How many months a year is your home occupied?
 - c. How do you describe your place to people who have never been here (there)?
2. What was it about this site that made you (your family) want to locate here originally?
 - a. Is the river important to you?
 - b. What do you like best about being near the river?
3. Are there any problems associated having property this close to the river?
 - a. What do you think is the most important problem?
4. Has there ever been erosion damage to your lot?
 - a. (If yes) How much of your place was affected?
 - b. Is there anything that should be or that can be done about erosion?
 - c. Why would that be your course of action?
5. Looking ahead 10 years, what do you expect your place to be like?
 - a. Will the physical facilities change?
 - b. Why is that?
 - c. As you think about the next generation, what are your primary concerns?
6. Some people talk about the river corridor....How is the river corridor different from the river itself?

(follow-up to explore “riparian” zone –with or without using that word)
7. Besides what you have already described, what are the various uses of the river?
 - a. How do you think the rights of all users can best be balanced?
8. What keeps you here?
9. Of everything we’ve talked about, what is most important to you?

2011 Protocol: Agricultural Participant
w/ Attention to Oil Spill on the Yellowstone River

1. How many years have you been in operation here?
 - a. Do you live here full time?
 - b. IF NOT: How many months a year is your home occupied?
 - c. How do you describe your place to people who have never been here?
2. What was it about this site that made you (your family) want to locate here originally?
 - a. Is the river important to you?
 - b. What do you like best about being near the river?
3. Are there any problems associated having property this close to the river?
 - a. What do you think is the most important problem?
4. Has there ever been flood damage to your land?
 - a. (If yes) How much of your place was affected?
 - b. Is there anything that should be or that can be done about flooding?
 - c. Why would that be your course of action?
5. Has there ever been erosion damage to your land?
 - a. (If yes) How much of your place was affected?
 - b. Is there anything that should be or that can be done about erosion?
 - c. Why would that be your course of action?
6. **Did you notice any impacts from the oil spill in 2011?**
 - a. (If yes) What types of impacts and how much of your place was affected?
 - b. Is there anything that should be or that can be done about the oil spill now?
 - c. Why would that be your course of action?
 - d. Was the response adequate?
7. Besides what you have already described, what are the various uses of the river?
 - a. How do you think the rights of all users can best be balanced?
8. Looking ahead 10 years, what do you expect your place to be like?
 - a. Will the physical facilities change?
 - b. Why is that?
9. As you think about the next generation, what are your primary concerns?
10. Some people talk about the river corridor....How is the river corridor different from the river itself?

(follow-up to explore “riparian” zone –with or without using that word)
11. What keeps you here?
12. Of everything we’ve talked about, what is most important to you?

**2018 Protocol--Agricultural Participant
w/ Attention to Drought, Cottonwood Forests and Long-term Impacts of Oil
Spills**

1. How many years have you been in operation here?
 - a. Do you live here full time?
 - b. IF NOT: How many months a year is your home occupied?
 - c. How do you describe your place to people who have never been here?
2. What was it about this site that made you/your family want to locate here?
 - a. Is the river important to you?
 - b. What do you like best about being near the river?
3. Are there any problems associated having property this close to the river?
 - a. Is there one problem that seems to be “most important”?
4. Has there ever been flood damage to your land?
 - a. (If yes) How much of your place was affected?
 - b. Is there anything that should be, or that can be, done about flooding?
 - c. Why would that be your course of action?
5. Has there ever been erosion damage to your land?
 - a. (If yes) How much of your place was affected?
 - b. Is there anything that should be, or that can be, done about erosion?
 - c. Why would that be your course of action?
6. Have you experienced **drought conditions** here?
 - a. What needs to happen when droughts occur?
 - b. Are you prepared for drought? (How so?)
 - c. What does the community need to do to prepare for drought?
 - d. How do you think droughts should be managed by agencies?
7. Some people talk about the river corridor....How is the river corridor different from the river itself?

(follow-up to explore “riparian” zone –with or without using that word)

(EXPAND COTTONWOODS when possible)
8. Did you notice **any impacts from the oil spill in 2011**?
 - a. (If yes) What types of impacts and how much of your place was affected?
 - b. (If yes) To what extent do you think the land and the river have recovered?
 - c. (If yes) Was the response adequate?
 - d. (yes or No) Is there anything that should be done about oil spills?
 - e. Why would that be your course of action?
9. Besides what you have already described, who are the other river users?
 - a. How do you think the rights of all users can be balanced, best?
10. What keeps you here? Looking ahead 10 years, what do you expect your place to be like?
 - a. Will the physical facilities change? Why is that?
11. As you think about the next generation, what are your primary concerns?
12. Of everything we’ve talked about, what is most important to you?