Flood Damage Reduction Preliminary Investigation Report for Kaycee, Wyoming

Requested by
The Town of Kaycee and
The Powder River Conservation District

Prepared in cooperation by
The U. S. Army Corps of Engineers and
The Natural Resources Conservation Service

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Executive Summary

On August 27, 2002, an estimated four-foot wall of water swept through the town of Kaycee, Wyoming, from flooding in the Middle Fork of the Powder River. Follow up analysis indicates the event was in the range of a 50 year event as shown by high water elevations. A post flood analysis by the Wyoming Emergency Management Agency performed on August 28, 2002, reported the following flood damage: 19 trailers, 22 houses, and 12 of Kaycee's 15 businesses. A total of 52 structures were deemed uninhabitable and a safety concern resulting in the removal of 22 individual homes, 5 businesses, and 25 outbuildings and vacant businesses were removed. The Natural Resources Conservation Service (NRCS) estimated the emergency response costs at $977,354, which included costs for debris removal, hazardous structure removal, emergency streambank protection, and road protection. On August 30, 2002, Wyoming Governor Jim Geringer requested disaster relief. On September 18, 2002, the Federal Emergency Management Agency (FEMA) informed Governor Geringer that their request for assistance was denied.

The town of Kaycee requested assistance under Section 205 in a letter to the U.S. Army Corps of Engineers (COE), Omaha District, dated October 15, 2002. The town of Kaycee requested watershed planning assistance through the Powder River Conservation District (PRCD) and the NRCS, on October 8, 2002. In turn, the PRCD requested NRCS assistance November 13, 2002.

NRCS and COE both felt it would be advantageous to cooperate in the development of a joint preliminary report for the town of Kaycee. The following alternatives were developed for evaluation during the preliminary study:

A. No Action Alternative
B. Upstream Detention or Storage
C. Levees/Floodwalls
D. Diversion/Cutoff Channels/Channel Clearing
E. Non Structural (raising, flood proofing, relocations)

Limited resource inventory, engineering, and economic studies were conducted on each alternative, or plan. Costs and benefits were determined for the levee plans, and the nonstructural plans. The remaining plans were either not engineeringly viable, or economically feasible to pursue. Levee plans providing 100-year level of protection were evaluated for the town. This included three alignments on the left bank flood plain, and one alignment on the right bank. The three left bank levees require a right bank levee be included if implemented. This is because the left bank levees induce flood stages on the right bank, thus requiring mitigation with the placement of the right bank levee – known as the South levee. A left bank levee, combined with the required South levee, are not economically feasible and do not have a Federal interest from the Corps' standpoint. However, the South levee by itself would be economically feasible. Nonstructural measures were evaluated and found to be economically feasible. A sampling of six potentially high damage buildings was made. Four had favorable benefit-cost ratios. The nonstructural plans included individually flood proofing the buildings by raising, relocation, or buyout. This measure meets the needs and objectives of the community. More detailed study would include the evaluation of all flood plain buildings to determine their feasibility.

Based on the results of this preliminary investigation, it is recommended that more detailed study be made of nonstructural measures. It would be for the purpose of identifying other buildings that have a positive economic BCR. It would include the evaluation of all flood plain structures.

As noted, at least one of the flood reduction plans has been identified as having a positive economic benefit/cost ratio. This would allow the federal government to proceed with further planning of a Kaycee Flood Reduction Project. Based on the outcome of the preliminary investigation, it is recommended by both the COE and NRCS that the town of Kaycee proceed with a request for detailed study and planning of flood reduction measures.

PROJECT REPORT

Project. A selected flood reduction plan must meet the criteria of the COE Section 205 Flood Damage Reduction Program, and NRCS PL-566 Watershed Protection and Flood Prevention Program during initial investigation. The intent of this document is to present the Preliminary Investigation Report for NRCS, and the Tab "E" Fact Sheet Report of the Corps, which is herein incorporated by reference.

PWI #: 179497

Wyoming's Congressional Delegation:

- Senator Craig Thomas
- Senator Mike Enzi
- Representative Barbara Cubin (At Large)

Authority for the Project & Report:

- Section 205 of the Flood Control Act of 1946, as amended (COE)
- PL-566 Watershed Protection and Flood Prevention (16 USC 1001-1010, 33 USC 70lb-1, 7 CFR 622) (NRCS)

Location. The study area is located in Kaycee, Wyoming (approximately 65 miles north of Casper in central Wyoming). The focus area is along the Middle Fork of the Powder River. See Figure 1 – Vicinity Map. The population of Kaycee is currently estimated to be 249.

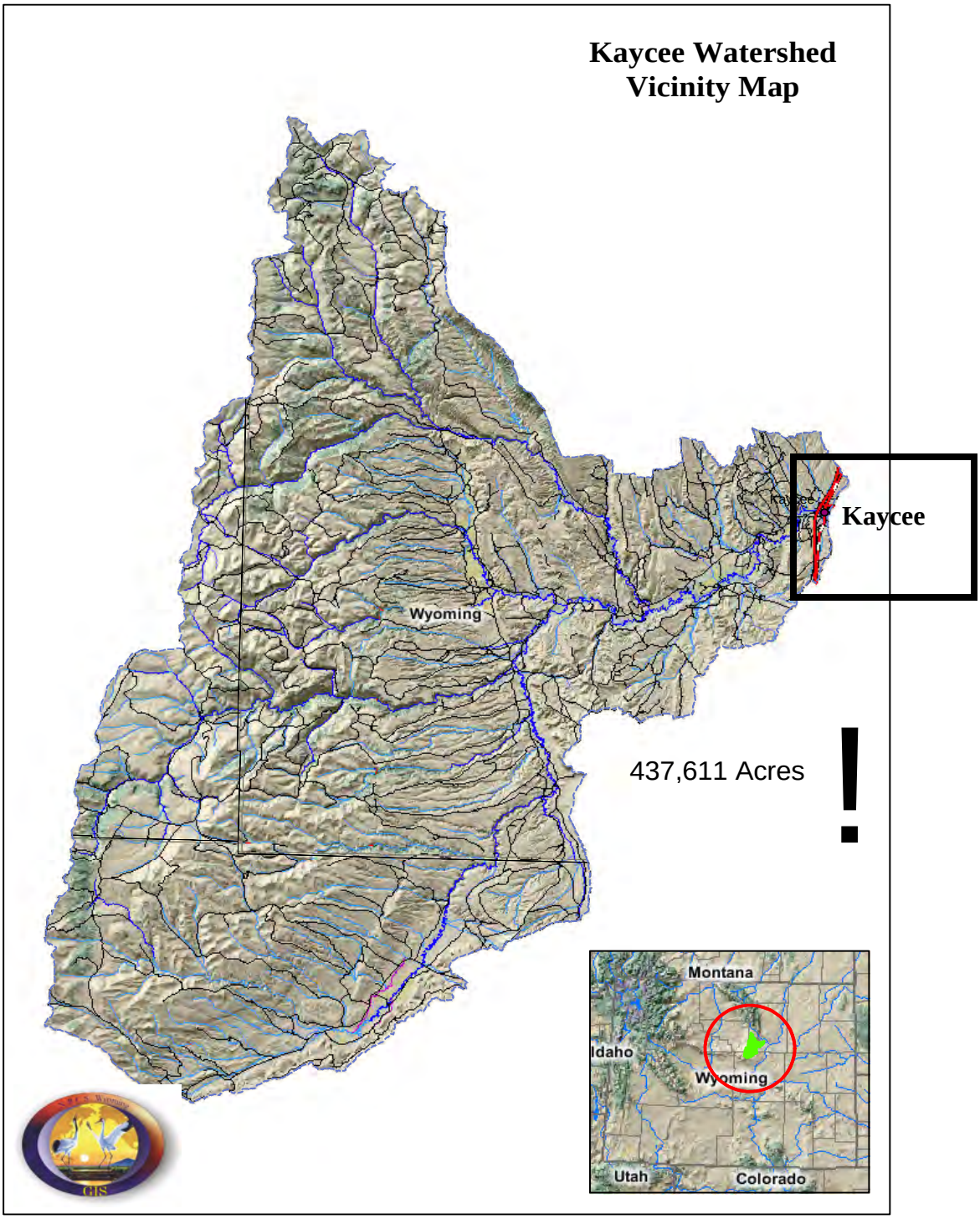

Figure 1 – Vicinity Map

Flooding Problem. This section will discuss the flood problem and flood history at Kaycee. Discussion begins with the most recent flood event that was the catalyst for the town's request for a Section 205 and PL-566 request for assistance. Expected annual damage (EAD), based on various flood events modeled, was estimated as part of the economic analysis. This is summarized below.

a. Recent Flood Event. On August 27, 2002, an estimated four-foot wall of water swept through the town of Kaycee, Wyoming from flooding in the Middle Fork of the Powder River. The damage in portions of Johnson County and specifically to Kaycee resulted from nearly 7.5 inches of rainfall that fell in portions of the Middle Fork of the Powder River Basin. Initial reports characterized the rainfall as a 500-year event; however, the follow up analysis indicates the event was in the range of a 100- to 200-year event. The intensity of the rainfall caused water torrents to sweep through the town causing residential and commercial buildings to be swept off of their foundations and careen into other structures and float downriver. A post flood analysis by the Wyoming Emergency Management Agency performed on August 28, 2002 reported the following flood damage: 19 trailers, 22 houses, and 12 of Kaycee's 15 businesses. Also affected were the post office, town museum, conservation district office, and the telephone company. A total of 52 structures were deemed uninhabitable and a safety concern. Twenty-two individual homes, five businesses, and 25 outbuildings and vacant businesses were removed for safety concerns. In addition to the devastation in Kaycee, damage to natural resources was reported 12 miles upstream and 30 miles downstream of the town. Estimates by the NRCS for emergency response costs totaled $977,354, which included costs for debris removal, hazardous structure removal, emergency streambank protection, and road protection (this does not include the value of the lost and damaged structures or the estimated 17,000+ hours of estimated time from volunteers in the flood recovery effort). On August 30, 2002, Wyoming Governor Jim Geringer requested disaster relief from President George Bush and the provisions of Section 201 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121-5206 (Stafford Act) and implemented by 44 CFR 206.36. The disaster declaration states "this Wyoming community lost 80% of their businesses (12 out of 15) and 30 – 35 % of their homes". On September 18, 2002, the Federal Emergency Management Agency informed Governor Geringer that their request for assistance was denied because "the impact of this event is not of a severity and magnitude that warrants a major disaster declaration and that an effective response would not exceed the combined capabilities of the State and local governments". Governor Geringer responded to President Bush and FEMA Director Joe Allbaugh on October 3, 2002 asking FEMA and the Federal Government to reconsider the minimum standards for disaster declaration stating that under current FEMA standards "seventy six percent of Wyoming towns and cities might each suffer a devastating event and not qualify under FEMA criteria".

b. Past Flood Events. Records show flooding has occurred in the following years in the town of Kaycee: 1927, 1930, 1963, 1978, 1985, 1993 (3 floods), 1995 (3 floods), 1996, (2 floods), and the aforementioned flood of 2002.

c. Estimated Annual Damage. The determination of the severity of the flood problem is a critical first step in the economic analysis. It is necessary in order to decide if a sufficient problem exists to justify Federal involvement in continued study. The magnitude of the flooding problem is calculated utilizing a standardized computer flood damage model. The model

computes estimated flood damages for specific floods and the EAD. The EAD for the town's floodplain structures and their contents is estimated to be $116,490. An additional 22 percent would be incurred due to damage to infrastructure (bridges, streets, sewers, etc) and the cost of emergency response activities. Accordingly, total EAD for all flood damage is $142,000. Detailed information is provided in Appendix E.

View of Federal, State, and Regional Agencies. Multiple agencies have actively responded to the 2002 flood event in the town of Kaycee. These agencies and efforts are shown in Table 1. The effort by these agencies is an indicator of the level of interest to help the town recover and the willingness to investigate providing a long-term solution to the flooding problems. In addition, elected officials from the State of Wyoming, as well as the entire Congressional delegation from the State, have been actively involved since the most recent flood event. They are very interested in having the agencies involved work together to find solutions to reducing damages from future floods on the Middle Fork of the Powder River.

Table 1. Responding Agencies

RESPONDING AGENCIES	TYPE OF INVOLVEMENT	STATUS
USDA Natural Resources Conservation Service, Kaycee & Buffalo Field Offices and Casper State Office	Emergency Response, Flood Damage Reduction study thru PL-566	Emergency Watershed Protection response and work complete. FDR efforts ongoing
Wyoming Emergency Management Agency	Emergency Assistance, communication support	Complete
Johnson County	Heavy equipment, manpower, floodplain management assistance	Initial efforts complete. Floodplain efforts ongoing
Small Business Administration	Low interest disaster loans	Ongoing
U.S. Army Corps of Engineers	Flood Damage Reduction thru Section 205 program	Ongoing
Federal Emergency Management Agency	Floodplain mapping thru National Flood Insurance Program	Ongoing
Wyoming Department of Transportation	Bridge inspection, road repair, road diversions	Complete
Wyoming Department of Health	Health, welfare, and environmental issues	Ongoing
Wyoming Department of Environmental Quality	Water testing, sewage issues and operations, hazardous material, permits for landfill	Ongoing

RESPONDING AGENCIES	TYPE OF INVOLVEMENT	STATUS
Wyoming National Guard	Personnel for debris operations and communication	Complete
Wyoming Business Council	Community survey support	Complete
Wyoming Department of Family Services	Community survey support	Complete
Red Cross	Temporary shelter, food, and water	Complete

Significant Effects. TBD

Supplemental Information.

a. Flood Plain Mapping. The Town of Kaycee does not have a designated FEMA flood plain map. There exists a FEMA "Special Flood Hazard" map available, however, it is outdated and probably does not reflect the existing flood hazard in the community. The Omaha District has been contacted by FEMA to develop a detailed flood plain map for the community. Currently the COE is awaiting topographic information to continue the flood plain assessment.

b. Lack of Disaster Declaration. The denial by FEMA of Kaycee's request for disaster declaration was not acceptable to the community. As detailed in this report, the town sustained extensive damage to homes and businesses that will require assistance from outside sources to rebuild. However, the community sought help from other agencies, particularly in the area of flood damage reduction. Currently, the COE, the NRCS in Wyoming, and FEMA floodplain management have teamed up to advise the community with the different courses of action from the Federal perspective and involvement. In addition, the town is committed to rebuilding and to be consistent with current floodplain management guidance and directives (such as removals, buyouts, open space floodplains, alternate uses of floodplain, etc.). This effort is an opportunity to assist a community to prevent the devastation and potential loss of life as occurred in the flood of August 2002.

c. NRCS's Emergency Watershed Protection Program.

In response to the devastating flood event of 2002, the Johnson County Commissioners, Lake DeSmet Conservation District (LDCD), Powder River Conservation District (PRCD), and the town of Kaycee made an urgent and compelling request for assistance through NRCS's Emergency Watershed Protection Program (EWP).

The EWP Program is administered and available through NRCS. The objective of the EWP program is to assist in relieving imminent hazards to life and property from floods and the products of erosion created by natural disasters that are causing a sudden impairment of a watershed. The scope of the program includes: "*Authorized EWP technical and financial assistance may be made available when an emergency exists. Emergency watershed protection*

consists of emergency measures from runoff retardation and soil erosion prevention as needed to reduce hazards to life and property from floods, drought, and the products of erosion on any watershed impaired by a natural occurrence."

As a result of the flood, five access bridges were undermined leaving people stranded and isolated. Roadsides were washed out making passage unsafe. Streambanks were eroded jeopardizing utility lines and putting human safety at high risk. By mid-morning, on August 27, 2002, the EWP program implemented two projects.

1. Johnson County was the sponsor for the "Town of Kaycee". Twenty-five percent, or 23 residences of the 90 had received major damage. Eighty percent, or 12 of the 15 businesses were flooded. The Town's major sewer line was exposed when floodwaters caused major bank erosion. Town water needed to be boiled because of contamination. Gas lines broke from movement of floating structures, and a two inch gas line separated due to severe bank erosion. This flood event occurred two weeks prior to the Deke Latham Memorial Pro Rodeo, a major economic activity for this community.

2. The Lake DeSmet Conservation District was the sponsor for work outside of the Town of Kaycee. Major damage had occurred to private, community, and county roads. Passage in and out was risky and unsafe. Bank erosion, due to the high floodwaters, jeopardized bridges, roads, and irrigation diversions.

The EWP program was used within the Town of Kaycee and both upstream and downstream of town to provide assistance. Total construction costs for both projects came to $902,339.25. The NRCS expended $535,143.07 and local contributions amounted to $367,196.18.

- ✓ 17,000+ hours of volunteer time were logged
- ✓ 23 homes, 6 businesses and 25 various vacant garages and outbuildings were removed
- ✓ 10+ acres of debris were removed
- ✓ 7,362 feet of river debris were removed
- ✓ Four bridges were protected
- ✓ 6,390 acres of hayland and pastureland were protected
- ✓ 2,443 feet of streambank were protected
- ✓ Five public, 55 private, and 19 business buildings were protected
- ✓ Six utilities were protected
- ✓ Estimated value of property protected - $3,370,683.00
- ✓ Economic benefit estimated to be - $982,125.00
- ✓ Environmental benefit estimated to be - $2,040,925.00
- ✓ Social benefit estimated to be - $3,679,757.00
- ✓ Total estimated benefit - $10,073,490.00
- ✓ The benefit/cost ratio for federal expenditures was 19:1

(Note: these numbers are slightly different from the numbers FEMA reports, because, the EWP numbers also includes structures <u>outside</u> of the town of Kaycee.)

Views of Sponsor. The town of Kaycee requested assistance under Section 205 in a letter to the COE, Omaha District dated October 15, 2002. In the letter, the town stated a willingness to participate per the requirements of the program. In addition, the community has shown a willingness to address and correct the problem by the emergency response action and other actions performed since the flood, including updating mapping for the town, relocating utilities, and coordinating with multiple agencies for assistance.

The town of Kaycee requested watershed planning assistance through PRCD and NRCS October 8th, 2002. The PRCD requested NRCS assistance on November 13, 2002.

An evaluation of the community's readiness to accept change was conducted in 2002 and is attached as part of Appendix B.

Kaycee Demographics.

• Population	249
• Median Income (household)	$33,056
• Per capita Income	$15,161
• Median house value	$58,800

Data from *Census 2000*

Proposed Action and Objectives of Report.
The NRCS and COE have investigated the feasibility of flood prevention actions, types of flood damage reduction measures, and the level of protection needed in the town of Kaycee, Wyoming to protect it from future flooding. This section of the joint report will explore the preliminary costs and benefits of flood protection through implementation of several alternatives.

- Objective #1: Examine confinement of floodwaters up to the 100-year flood event in the river channel, or flood channel. Allow flood flows to pass the town without causing damage to town buildings.
- Objective #2: Examine nonstructural measures for buildings that are currently located in the flood channel for purposes of flood proofing.
- Objective #3: Examine measures to protect the business portion of town from the 100-year flood event.

The Need for the Action.
Approximately one-fourth of the town is constructed in the 50-year floodplain and consists mainly of mobile homes and the majority of buildings in the business section.

The flood of 2002 damaged approximately 26 residences and caused over $2 million in damages to the town of Kaycee. The flood destroyed the main grocery store and severely damaged the post office. In the last 10 years, there have been six flood events through town.

- Need #1 Protection of the private residences located in the floodplain along the river inside of the town boundaries.
- Need #2 Protection of the business area from flooding.
- Need #3 FEMA mapping of the flood plain.
- Need #4 Relocation of residences as a consideration in the planning effort.

The Interstate highway west of the town tends to act as a retention structure that backs water up. This directs floodwater in the direction of the town.

The town of Kaycee does not have a designated FEMA flood plain map. There is a FEMA "Special Flood Hazard" map available that is outdated and may not reflect the true flood hazard in the community.

Alternative Plans Considered Including the Proposed Action. Alternative plans considered in this preliminary study are discussed in following sections of the report. It should be noted that these preliminary plans are not entirely all that could possibly reduce flood damages in Kaycee. These initial plans were identified by the federal agencies, reviewed by the town of Kaycee, and selected for consideration in this preliminary assessment for the purpose of finding a Federal interest.

Description of Alternatives.

Alternative A – No Action

Conditions will remain as they are and no flood control measures will be implemented. The town will continue to contend with frequent flooding and the consequential threat of loss of lives and damage to property. Community development and improvement will be limited. Without financial help the community cannot relocate people out of the flood plain or mitigate the recurring flood damage. The threat of future flood damages will continue resulting in determinations similar to 2002, where Kaycee was not eligible for FEMA assistance . That is unless the regulations are changed.

Floodwater damage to structures and contents is approximately $915,100 with a 100-year flood, or $116,500 average annual damages. When damage to infrastructure and National Flood Insurance Program costs are included, the average annual damage is $150,800.

Without flood prevention/mitigation the town will continue to have the expense and effort of contending with damage, debris, and sediment from floods. The bridge on Nolan Avenue will continue to be at risk from floodwaters. If the bridge is destroyed or damaged, direct access for individuals south of the bridge to the interstate, emergency services, and general services will be eliminated – the alternate is a very lengthy, circuitous route.

Individuals will continue to rebuild within the floodplain. For many of these individuals this is the only land they own, they do not have the financial resources to move to out of the floodplain. Their ability to rebuild is stretched with each successive flood, and the structures or repairs will be of lesser quality than what they had before. That portion of town within the floodplain will continue to sustain damage on a frequent basis which will lead to a decline in appearance and quality of structures in that portion of town. Based on an assessment of the community, the population of Kaycee is stagnant. With additional flooding, the community acknowledged the likely downward trend with people leaving after additional flood events.

Social Effects - Flooding from the Middle Fork of the Powder River has been stressful for the residents of Kaycee. Social effects include:

- Emotional stress associated with the fear of impending floods, especially among the elderly and children;
- Threats to human health and safety;
- Economic burdens associated with post-flooding repairs and clean-up activities;
- Depressed real estate values;
- Closure of transportation routes which restrict traffic, especially emergency services;
- Personal despair caused by the loss of or damage to, clothing, home furnishings, vehicles, appliances, and other personal belongings;
- Loss of community and personal pride when time and money that could be spent to improve and strengthen the community must instead be directed toward flood-recovery activities.

Alternative B – Upstream Detention or Storage

There have been numerous previous studies that identified potential stream storage sites. In September 1961, the NRCS (SCS at the time) was requested by North Fork Powder River Water Users. A Preliminary Investigation Report (PIR) was completed which identified flood mitigation measures, including storage, as a potential alternative. In this PIR, the watershed problems and needs identified included: 1) flood prevention, 2) drainage, both surface and subsurface, and 3) irrigation water supply.

NRCS identified that storage of 50,000 acre feet was needed. NRCS evaluated the costs and benefits of storage for flood protection and in the 1961 PIR made the following statement "storage sufficient to protect Kaycee is not economically justified, the costs far exceed the benefits."

For the irrigation water supply need, NRCS identified and located three potential storage locations for irrigated water supplements and concluded in the PIR report that these storage sites could be cost effective, as irrigation water supply.

In January 1976, the Bureau of Land Management (BLM) completed and issued a Draft Environmental Impact Statement (EIS). In the EIS, BLM identified a reservoir on Middle Fork Powder River. This structure was planned for 50,000 acre feet of reservoir storage for use by agriculture for irrigation and industry for undisclosed purposes. The structure was planned for 1,160 surface acres of surface water including 1,019 acres of private property and approximately 141 acres of BLM property. In the 1976 EIS, BLM identified the estimated cost for this structure at $30-$35 million. It is not known if BLM ever issued a Record of Decision (ROD) on this EIS or what happened to this planning document.

In January 1986, the Wyoming Water Development Commission (WWDC) contracted with North Fork of Powder River Water Users to complete a Level III study, titled "Conceptual Design Report for the Middle Fork Powder River Dam and Reservoir Project." This report

identified and planned for a 190 ft. high dam, impounding 59,600 acre feet of storage. In 1986, this report identified the estimated cost of this dam at $43,500,000. This report is not available.

In February 2002, the WWDC commissioned the study and publication of the Powder/Tongue River Basin Plan Final Report. This very broad basin plan identified four potential storage/reservoir projects in the Powder River upstream from Kaycee, for "future water use opportunities". These four structures varied in storage size and the 2002 WWDC report did not contain any cost estimates.

Using U. S. Geological Survey (USGS) estimating procedures as revised in 2003, the following flows and storage volumes can be anticipated.

Assuming a channel capacity of 3,000 cfs the following flows and storage volumes apply. An estimated cost of $2,000 per ac/ft of storage is used.

Interval	Use for peak flows	Channel Capacity	Excess flow	Storage (acre feet) required for maximum flow of 3000 cfs	Cost
Q1.5	1166	3000			
Q2	1564	3000			
Q2.33	1782	3000			
Q5	3034	3000	34	0	0
Q10	4442	3000	1442	13400	$26,800,000
Q25	6876	3000	3876	48500	$97,000,000
Q50	9355	3000	6355	89400	$178,800,000
Q100	12597	3000	9597	146800	$293,600,000
Q200	16818	3000	13818	226800	$453,600,000
Q500	24512	3000	21512	377000	$754,000,000

Conclusion: There appear to be potential storage locations upstream of Kaycee that could be used in conjunction with flood reduction. All the cited studies concluded that the expense of a flood control structure far exceeds the potential benefits.

Alternative C – Levee/Floodwall

As part of the preliminary evaluation of the levee alternatives, an economic analysis was performed. The findings summarized here, are presented in detail in Appendix E of this report. To perform the economic analysis, the flood plain was divided into four subareas. These were for data collection and plan formulation purposes. The subareas are defined as follows:

Subarea 1- North of the Middle Fork of the Powder River and west of Main Street (Nolan Avenue).

Subarea 2- North of the Middle Fork of the Powder River and east of Main Street.

Subarea 3- South of the Middle Fork of the Powder River and west of Main Street.

Subarea 4- South of the Middle Fork of the Powder River and east of Main Street.

Levees on both the left (north) and right (south) banks of the river were considered. Three left bank levee alignments were evaluated. These are levee alignments A, B, and C. One alignment was considered on the right bank – referred to as the South levee. The levees were formulated to provide protection from the 100-year event. An additional three feet of freeboard was added to the levee height to allow for any uncertainties with design or the 100-year flood depths. This freeboard is required to certify the levee and remove the flood prone area from the designated FEMA flood hazard area. At Kaycee, the top of the freeboard height would equate to approximately the 500-year event. See map in the attached Hydraulic Analysis.

An additional and important consideration with the formulation of levee plans has to do with the potential for flood depth inducement. It has been determined that the three 100-year left bank levee alignments (A, B, and C) would cause an increase in flood depths on the opposite right bank (south) flood plain. This condition would require a right bank levee to negate the induced flood stages on this right bank flood plain. In other words, if a 100-year left bank levee was to be constructed, the South (right bank) levee would be required to mitigate or prevent induced damages. However, if only a 100-year South levee was constructed by itself, there would not be flood stage inducement on the left bank.

Construction Costs - Cost estimates were prepared for the three left bank alignments. Construction costs for alignments A, B and C are estimated to be $1,582,440, $1,576,150 and $1,528,470 respectively. These costs include contingencies, planning, engineering and design (PED), as well as construction management costs. Alignments B and C are somewhat shorter in length than alignment A. That is because they are set back further from the channel than alternative A. Additionally, they would require the acquisition of real estate to mitigate induced flooding to property located between (riverside) the left and right bank levees. Additionally, alignments B and C would protect fewer structures than A. Based on the need for extensive additional real estate, and the fewer structures protected, alignments B and C were eliminated from further consideration. Alignment A became the most viable left bank levee alignment from a standpoint of what would be protected.

The South Levee (right bank) construction cost was not generated using the Corps' computer program. It was estimated based on design similarities of the left bank levees. Adding contingencies, planning, engineering and design (PED), as well as construction management costs, the estimated construction cost for the South Levee is $377,650.

Real Estate Costs - Real estate costs were estimated for Alignment A and the South levee. This was based on the number of structures acquired, land area required for the levee, and other related acquisition costs.

Total Project Cost – total project cost, including construction, design, project management, and real estate acquisition are shown separately for Levee alignment A and the South Levee in table 2.

Table 2
Levee Project Estimated Costs

Alignment A	Cost
Construction	$1,582,440
Real Estate	$1,138,410
Total Cost	$2,720,850

South Levee	Cost
Construction	$377,650
Real Estate	$403,650
Total Cost	$781,300

Economic Costs – these costs include construction, real estate, interest during construction (IDC), interest, and operation and maintenance (O&M). The costs are self-explanatory except for IDC, which is the opportunity cost of the capital committed during construction before the project accrues income. IDC is computed for construction and real estate expenditures. The IDC computation assumes a one-year construction period, including land acquisition, and an average of one half the total cost expended over the year. The current annual Federal interest rate of 5.625 percent is used. IDC is $76,500 and $22,000 for Alignment A and the South Levee respectively. A nominal annual expenditure of $5,000 is assumed for O&M for each project. Accordingly, O&M is $10,000 annually for the combined Alignment A left bank levee and the South Levee.

Benefit Cost Analysis – the economic costs and benefits of Levee Alignment A (inclusive of South Levee) and the South Levee (alone) has been determined. The benefit to cost ratios (BCR), net annual benefits, and the net present value of benefits are presented in table 3.

Table 3
Benefit Cost Analysis

Levee Alignment A (w/South Levee)	Cost
Construction and Real Estate	$2,720,850
IDC	$ 73,100
Total	$2,793,950
Annual Costs	
Interest and Amortization (1)	$162,000
O&M	$ 10,000
Total	$172,000
Annual Benefit (2)	
Flood Damage Reduction (100-yr levee)	$123,150
Freeboard Benefit (500-yr freeboard)	$ 7,320
NFIP Administration Savings	$ 4,990
Total	$135,460
Benefit to Cost Ratio	0.79
Net Annual Benefit	($36,540)
Present Value Net Benefit	($630,120)

South Levee (alone)	Cost
Construction and Real Estate	$781,300
IDC	$ 21,000
Total	$802,300
Annual Costs	
Interest and Amortization (1)	$46,520
O&M	$ 5,000
Total	$51,520
Annual Benefit (2)	
Flood Damage Reduction (100-yr levee)	$86,210
Freeboard Benefit (500-yr freeboard)	$ 2,790
NFIP Administration Savings	$ 2,250
Total	$91,250
Benefit to Cost Ratio	1.77
Net Annual Benefit	$39,730
Present Value Net Benefit	$685,350

Notes Table 7:
(1) Costs amortized over a 50 year project life at an annual interest rate of 5.375 percent.
(2) Alignment A accrues benefits from subareas 1,2, 3 and 4. The South Levee accrues from 3 and 4.

As shown in table 3, levee alignment A, combined with the required South levee, is infeasible by a wide margin with a BCR of 0.79 and a negative net present value of benefits. In as much as the South Levee is feasible and not dependent on a structure on the opposite bank, the correct method of analyzing the left bank, or north side Alignment A levee would be an incremental analysis. Using this approach, levee Alignment A would be considered as an added increment to the South Levee. Accordingly only benefits from subareas 1 and 2 would accrue to the project (benefits from subareas 3 and 4 having already been accrued to the South Levee) and it would be infeasible by an even wider margin, with a BCR of 0.38.

The South Levee, by itself, has a BCR of 1.77 and a present value of net benefit (capitalized value of annual benefit minus annual cost) of over $685,000. The South Levee provides the greatest net benefit, and is the NED alternative whereby there would be a Corps' Federal interest.

Alternative D – Raising/Flood Proofing/Relocation

Evaluation of a channel improvement alternative indicated that this measure would not significantly lower the 100-year flood flow. The average reduction through the project reach was calculated to be 0.9 feet. Similarly, a diversion channel alternative decreased the 100-year flood elevation from 0 to 0.8 feet. Clearing the channel of debris, which is always beneficial, did not significantly lower the flood depths either. None of these measures proved to be viable at reducing the 100-year flood elevations.

Alternative E – Nonstructural Relocation/Removal/Buyout

A nonstructural flood damage reduction assessment was conducted for the Town of Kaycee, Wyoming. As a means to eliminate or reduce future flood damages within the community, this assessment investigated the feasibility of implementing nonstructural measures for individual structures. For this assessment, nonstructural measures are defined as modifications incorporated into the design, construction, or alteration of individual buildings or properties that will reduce flood damages. In general, nonstructural flood proofing includes any effort property owners may take to reduce flood damages to buildings and their contents.

The depth of flooding and the frequency in which a building and its contents may be flooded determine the potential for flood damages to occur. Flood proofing a building will decrease the potential for damage from future floods. Without flood proofing, a building is subject to damage from all floods that enter the lowest elevation of the building or rise above the first floor elevation. With flood proofing techniques such as raising a building, floodwaters must rise to a higher elevation to cause damage.

Flood proofing can benefit the property owner in several ways. It will save money that would otherwise be spent to repair and clean the exterior and interior of the building as well as reducing the expense of replacing building contents. Also, damage prevented by flood proofing will reduce the inconvenience and annoyance caused by the time-consuming process of cleaning up and repairing a building.

Nonstructural techniques considered were raising, or elevating, the building in place so that the lowest damageable floor is located above the flood level for which flood-proofing protection is provided. The building is raised and set on a new or extended foundation.

Another technique examined is the relocation or removal of buildings from the flood plain. Relocating a building is the most dependable, but generally the most expensive way to flood proof. This method involves moving the structure to another location away from flood hazards, either to a higher elevation on the existing lot or to a new site. Relocating a structure out of the flood plain is appropriate if the building is in an area where flood hazards are such that continued occupation is unsafe. It is also an option for the property owner who wants to be free from the damages, and worry associated with flooding.

Another nonstructural measure considered is dry flood proofing. It involves sealing the exterior side of building walls with waterproofing compounds, impermeable sheeting, or other materials and using shields for covering and protecting openings from floodwaters. In areas of shallow, low velocity flooding, shields can be used on doors, windows, vents, and other building openings. The first step with the use of shields placed directly on buildings is to be certain that both the shield and the building are strong enough and sufficiently watertight to withstand flood forces. Sewer lines should be fitted with cutoff or check valves that close when floodwaters rise in the sewer, to prevent backup and flooding inside the building.

The nonstructural assessment investigated the potential feasibility of flood proofing six different structures for the community of Kaycee. The results indicate that it would be feasible to implement nonstructural measures such as raising, dry flood proofing, and relocation for these structures.

For this assessment six structures were identified and investigated to determine if nonstructural mitigation would be feasible. The structures that were investigated consisted of a commercial store, three one-story houses without basements, a mobile home, and a two-story house without basement.

The analysis indicated that it would be feasible to implement nonstructural measures such as raising, dry flood proofing, and relocation of four of these six structures. Total cost estimated to implement is $197,380. The combined annual benefit is estimated to be $35,760. Using an annual discount rate of 5.375 percent and an appropriate project life (varying from 20 to 50 years dependent on structure type and age) the combined annual cost for the four feasible nonstructural projects is $12,975. The combined BCR for the four nonstructural projects is 2.8. Below table presents the economic and financial data.

ECONOMIC AND FINANCIAL DATA FOR RECOMMENDED PLAN

a. Estimated Implementation Costs: ($**197,380** at 2004 Price Levels)

Federal	$128,300
Non-Federal	
LERRD $ 10,000	
Cash $ 59,080	
	$ 69,000
Total	$197,380

b. Economic Data: (5.375%, 50 year life)

Annual Charges: $ 15,870
(Includes $2,450 OM&R; Fed OM&R = $ 0)

Annual Benefits: $ 35,760
BCR: **2.80**

c. Cost Allocation:

Project Purpose	Federal	Non-Federal	Expected Annual Benefits
Flood Reduction	$ 128,300	$ 69,080	$ 35,760
Total	$ 128,300	$ 69,080	$ 35,760

d. Allocations to Date:

	Federal	Non-Federal
Feasibility, etc.	$ 51,000	$ -
Total	$ 51,000	$ -

e. Remaining Requirements:

	Federal	Non-Federal
Feasibility	$ 49,000	$ 50,000
Construction	TBD	TBD
Total	$ 100,000	$ 50,000
f. Total Allocations:	$ 100,000	$ 50,000
g. Future Non-Federal Reimbursements:	$ -	$ -
h. Cost:	$100,000	$50,000

A detailed nonstructural analysis for all structures located in the existing flood plain could identify additional structures which would be feasible to flood proof singularly, or perhaps as small groups of two, three or four structures, where low lying barriers could be implemented to benefit several structures having low to moderate damage levels.

Status of Environmental Statutes Compliance.

Threatened, endangered, proposed and candidate species. The table below gives the species and status of threatened, endangered, proposed, and candidate species for Johnson County in Wyoming. There are no plant species listed for Johnson County. Data provided by the US Fish and Wildlife Service. (7/30/2002)

Species	Status
Black-footed Ferret	Endangered
Bald Eagle	Threatened
Canada Lynx	Threatened
Mountain Plover	Proposed
Black-tailed Prairie Dog	Candidate

The Wyoming Game and Fish Department also lists native species of concern. This list is not broken down to the County level, it is state-wide. Species in the NSS1 column in the table below are at higher risk. If this project progresses to an EA or EIS, and Alternatives become site specific, the NRCS and/or COE biologist will coordinate with the Wyoming Game and Fish Department to address any species of concern that occur in Johnson County and the Middle Fork of the Powder River.

Fish and Amphibian Species	
NSS1	NSS2
Bluehead sucker	Bonneville cutthroat
Finescale dace	Burbot
Flannelmouth sucker	Colorado River cutthroat
Hornyhead chub	Goldeye
Leatherside chub	Kendall WS dace
Pearl dace	Orangethroat darter
Roundtail chub	Plains topminnow
Sturgeon chub	Sauger
Suckermouth minnow	Shovelnose sturgeon
Western Silvery minnow	Yellowstone cutthroat
Wyoming toad	
Boreal toad	
NonGame Bird Species	
Common Loon	Trumpeter Swan
	Bald Eagle
	Yellow-billed Cuckoo

NonGame Mammal Species	
Black-footed Ferret	Pygmy Shrew
Lynx	Spotted Bat
	Long-eared Myotis
	Northern Myotis
	Long-legged Myotis
	Townsend's Big-eared Bat
	Pallid Bat
	Fringed Myotis

Source: Wyoming Game and Fish Department

Section 106, NHPA (National Historic Preservation Act) Compliance.
A file search at the Wyoming Cultural Records Office of the immediate area around Kaycee was conducted on 2/10/03. Three sections showed known sites, eligibility unknown or non-contributing segment. Most of the sites reported are connected with the Bozeman Trail. As there are very few segments of the Bozeman Trail that are identifiable, any trace or records found of the Trail will require an evaluation by either the NRCS and/or COE archeologist. There are no sites in Johnson County, Wyoming on the National Register of Historic Places, National Registry of Natural Landmarks, National Register of Historic Landmarks, or the World Heritage List. There is a Certified Local Government in Johnson County out of Buffalo. The Table below lists the sites listed by the Wyoming State Historical Society that are in Johnson County and in or near Kaycee. Sussex is included since it is just downstream of Kaycee.

If flood proofing or relocation is an alternative in either an EA or EIS, the NRCS Cultural Resource Specialist should evaluate the structures in question to determine if they are eligible properties before any actions are taken, to avoid harming their eligibility.

County	Site	Location	City	Description
Johnson	Dull Knife Battlefield	N of Barnum	Barnum	
Johnson	Lake Desmet Segment, Bozeman Trail	Address Restricted	City Unavailable	Bozeman Trail in Wyoming MPS
Johnson	Trabing Station--Crazy Woman Crossing	Address Restricted	City Unavailable	Bozeman Trail in Wyoming MPS
Johnson	AJX Bridge over South Fork and Powder River	I-25 W. Service Rd. (old hwy 87)	Kaycee	Vehicular Truss and Arch Bridges in Wyoming TR
Johnson	Sussex Post Office and Store	Sussex Rd. and Powder R.	Kaycee	
Johnson	Cantonment Reno	5 mi. N of Sussex at Powder River	Sussex	
Johnson	EDZ Irigary Bridge	Cty. Rd. CN16-254	Sussex	Vehicular Truss and Arch Bridges in Wyoming TR
Johnson	Fort Reno	E of Sussex on Powder River	Sussex	
Johnson	Powder River Station--Powder River Crossing (48JO134 and 48JO801)	Address Restricted	Sussex	Bozeman Trail

Source: National Register of Historical Places, National Park Service

Description of Recommended Plan. The preliminary assessment indicates that a nonstructural plan, to reduce or eliminate flood damages, is economically feasible for four of six flood plain buildings initially evaluated. Although not the NED plan, it does meet the objectives of the town to reduce left bank damages. Unlike the right bank (South levee) which has no benefit to the location where the town recognizes flooding to be more of a problem to them. The nonstructural plan entails the modification of individual buildings to prevent or reduce flood damages. Among all the flood plain structures, six potentially high damage structures were sampled, and investigated. The structures initially screened consisted of a commercial store, three one-story houses without basements, a mobile home, and a two-story house without basement. Four of the six buildings were determined to be economically feasible to implement nonstructural measures.

Conclusions with Recommendation for Action:
The No Action plan would not meet any of the objectives of this study or the needs by the town to resolve its flood problems. The Nonstructural measures were found to be economically feasible. Although this measure does not meet the objective of reducing the potential for loss of life. It could be environmentally sensitive, and may not be socially acceptable flood protection for all properties located in the damage area. Other than the south bank levee segment, the other structural measures were either too expensive to construct or did not meet the objectives for providing acceptable flood protection to the inhabitants of the damage area. It is recommended that the nonstructural measures be pursued in detail study to include all flood plain structures for the purpose of identifying other feasible candidates. Reference COE Tab “E” Fact Sheet Report.

Decisions that must be made.
The town of Kaycee Town Council must decide how to protect the town and at what flood frequency the town should be protected in a cost effective manner with the planning and financial assistance of the federal government.

List of Preparers.

U. S. Army Corp of Engineers:

Nelson Carpenter, Project Manager
Gary Lien, Hydraulic Engineer
Randy Behm, Hydraulic Engineer
Timothy Fleeger, Environmental Specialist
Gene Sturm, Senior Economist
John Palensky, Project Manager

Natural Resources Conservation Service:

George W. Cleek IV, Assistant State Conservationist – Programs
Randy Wiggins, State Geographic Information System (GIS) Coordinator
Edith Bennett, State Economist
Evan Murray, Resource Conservationist
Mark Opitz, State Conservation Engineer
David Taylor, State Hydrologic Engineer
Lee Hackleman, Design Engineer
Allison Engle, District Conservationist
Kathie Starkweather, Sociologist

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Appendix A – Emergency Watershed Program Final Reports – Kaycee

EWP FINAL REPORT

1.	**Name of the Disaster:** Out of Town	**2.**	**Assigned Project Code No:68-8E49-2-29**
3.	**State:** Wyoming	**3.**	**Date of Event:** August 27th, 2002
4.	**Completion Date**: 8/6/03	**5.**	**Report Date:** 9/18/03
6.	**County(ies)**: Johnson City(ies) Kaycee	**7.**	**Sponsor(s)**: County __ SCD X Cities ____ Tribes ____ State ____
8.	**Total Construction Cost**: $ 114,401.50	**9.**	**Amt. FA Expended**: $ 84,731.14
10	**Amt. TA Expended**: $	**11.**	**Value of Local Contrib.** : $ 29,670.36
12.	**Type of Disaster:** Flood: X Fire: ___ Hurricane: ___ Tornado: ___ Typhoon: ___ Earthquake: ___ Ice Storm: ___ Other (Type): _____		
13.	**Description of the Disaster**: Nearly 7.5 inches of heavy rainfall impacted the community of Kaycee and surrounding areas between midnight and 4 A.M. on the morning of August 27th, 2002. Roads, bridges, and irrigation diversions throughout the county were damaged by the large amounts of rain. A damage survey conducted by the Service Hydrologist and Warning Coordination Meteorologist determined that Murphy Creek in southern Johnson County was at one point 300 yards wide and approximately 20 feet deep near Lone Bear Road. This creek eventually compromised the safety of the northbound Interstate 25 bridge over Murphy Creek.		
14.	**Number of DSR's Completed**: 7	**15.**	**Number of Sites Treated: 14**
16.	**RESULTS: OUTCOMES:** # of Public Bldgs Protected: _____ # of Private Bldgs Protected: 7 # of miles of Road Protected: 2.5 # of Utilities Protected: _____ # Businesses Protected 4 Value of Property Protected: $1,282,125.00 Other: Bridges: 4	**17.**	**RESULTS: OUTPUTS**: Ft of Debris Removed: 750 Acres of Land Protected: 6,190 Feet of Streambank Stab: 1,580 Other: _____ Total Benefits Econ: ($) 232,125.00 Environ: $1,240,925.00

			Social: $ 41,200.00
19.	**Number of Individuals Benefited:** Elderly: _____ Minority: _____ Total: 13 Other: Non-Hispanic Males:10, Non-Hispanic Females:3 Units of Government: 1		
20.	**Description of environmental and cultural resources affected, degree of impacts to each, and the benefits accrued by the project to the environmental and cultural resources**: Due to the high water, bank erosion was substantial. Debris and sediment blocked the waterways. Structures such as, culverts, bridges, headgates, fences, walk bridges, stock crossings, and community/county roads were put at risk. By implementing EWP we protected 6190 acres of irrigated hay/pasture land, livestock trails, community ingress/egress, private and county roads and bridges.		
21.	**Description of combined Beneficial (Evt. Econ. and Soc.) Effects Accrued**: Hay and pasture crops, suffering from three years of drought, were protected by the implementation of the EWP program. Safety measures were used to protect bridges and roads. Debris was removed from damaged bridges and roads to protect them from further danger. Banks were stabilized from further deterioration, providing additional protection to homes, bridges and roads.		
22.	**Description of any unusual situations or problems**. This storm event was a phenomenon; the 300-foot wide wall of water was indescribable.		
23.	**Were 8(a) set aside, woman owned, or small business contractors used for NRCS activities? NO** **Number of Contracts**: ____ **Dollar amount of such contracts or procurements**: _____		
24.	**Briefly describe what lessons you learned and what you would do differently next time**. Community support is high in Wyoming. NRCS's EWP program provided the necessary means for this community to survive this devastating event.		

I certify that all Emergency Work for this disaster under the EWP program is complete and was carried out within NRCS Policies and procedures. I am hereby returning $285,234.04 of unused funds from this project.

Signed: _____State Conservationist Date: _____

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EWP FINAL REPORT

1.	**Name of the Disaster:** Town of Kaycee	**2.**	**Assigned Project Code No:68-8E49-2-28**
3.	**State:** Wyoming	**3**.	**Date of Event:** August 27th, 2002
4.	**Completion Date**:	**5.**	**Report Date:**
6.	**County(ies)**: Johnson City(ies) Kaycee	**7.**	**Sponsor(s)**: County X SCD ___ Cities ____ Tribes ____ State ____
8.	**Total Construction Cost**: $787,937.75	**9.**	**Amt. FA Expended**: $450,411.93
10	**Amt. TA Expended**: $	**11.**	**Value of Local Contrib.** : $337,525.82
12.	**Type of Disaster:** Flood: X Fire: ___ Hurricane: ___ Tornado: ___ Typhoon: ___ Earthquake: ___ Ice Storm: ___ Other (Type): _____		
13.	**Description of the Disaster**: Nearly 7.5 inches of heavy rainfall impacted the community and surrounding area between midnight and 4 A.M. on the morning of August 27th, 2002. Kaycee's normal annual precipitation is 12.3 inches. This intense rainfall equated to approximately two-thirds of the annual precipitation. Approximately 4 feet of water traveled through the town of Kaycee. Twenty-one residences, of approximately 90 in the community, were either destroyed or received 'major' damage. Kaycee lost 80% of their businesses (12 out of 15) and 30-35% of their homes (21 residences out of approximately 90) were either destroyed or received 'major 'flood damage.		
14.	**Number of DSR's Completed**:1	**15.**	**Number of Sites Treated:**
16.	**RESULTS: OUTCOMES:** # of Public Bldgs Protected: 5 # of Private Bldgs Protected: 48 # of miles of Road Protected: _____ # of Utilities Protected: 6 # Businesses Protected 15 Value of Property Protected: $2,088,557.895 Other: _____ _____	**17.**	**RESULTS: OUTPUTS**: Ft of Debris Removed: 6612 Ft. Acres of Land Protected: 200 Ac Feet of Streambank Stab: 863 Ft. Other: Sewer Protected Total Benefits Econ: ($) 750,000.00 Environ: $ 800,000.00 Social: $ 3,638,557.00

19.	**Number of <u>Individuals</u> Benefited:** Elderly: <u>30</u> Minority: <u>3</u> Total: <u>249</u> Other: <u>216</u>
20.	**Description of environmental and cultural resources affected, degree of impacts to each, and the benefits accrued by the project to the environmental and cultural resources**: Sewer and water were at risk. The town's main sewer and lagoon system was being threatened. Drinking water needed to be boiled for three days. Natural gas leaks were caused by the river banks falling. Buildings were washed off of their foundations, placing the community at risk for further flooding. Town infrastructure was protected; buildings and debris were removed.
21.	**Description of combined Beneficial (Evt. Econ. and Soc.) Effects Accrued**: This community is a low tax based, agriculture center for Southern Johnson County that was shut down. We provided the mechanism to reduce the risk to human health and safety.
22.	**Description of any unusual situations or problems**. Utility locations, gas leaks and ownership of debris were the only major struggles.
23.	**Were 8(a) set aside, woman owned, or small business contractors used for NRCS activities? NO** **Number of Contracts**: ____ **Dollar amount of such contracts or procurements**: _____
24.	**Briefly describe what lessons you learned and what you would do differently next time**. Community support in Wyoming is high. The local fire district established a command center. Volunteers came from every where, over 17,000 hours of time was logged during the 10-day period. NRCS championed this project. Without our assistance, this community would still be trying to recover from the devastation caused by this flood event.

I certify that all Emergency Work for this disaster under the EWP program is complete and was carried out within NRCS Policies and procedures. I am hereby returning $ _____ of unused funds from this project.

Signed: _____State Conservationist Date: _____

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Appendix B – Attitude Toward Change Survey, Social Assessment, and Demographic Detail.

Kathie Starkweather, Sociologist for USDA-NRCS was asked by the Kaycee Steering Committee and the Economic Development Committee to determine the community's readiness for change. Kathie met with four focus groups (approximately 40 people) Monday, September 12th, 2003. Two focus groups consisted of residents of Kaycee (both rural and urban). One focus group was held at the high school, and the other focus group was held with the Kaycee Steering Committee.

Kathie asked a series of eight questions. The following are some of the highlights from these questions:

- The town pulled together to rebuild right after the flood –no one was surprised "That's just the way we do things around here".
- Community Pride – The flood has helped re-establish a need for community pride – community cleanup.
- Safety – A real focus on the need to regain a sense of security and performance.
- Floodplain Home Sites- People have rebuilt in the floodplain due to the fact that there is no place else to go. People are aware that this definitely needs to be changed.

Kathie feels that this community at this point certainly understands and acknowledges that there will be change – they've seen it in a devastating manner with the flood and are continuing to see it as the community goes through the long process of rebuilding. The community understands that ready or not, something has to be done to ensure the towns future.

Kaycee Community Assessment completed by the Rural Resource Team – Wyoming Rural Development Council in 2004.

The Wyoming Rural Development Council (WRDC) provided a Resource Team to assist the town of Kaycee, Wyoming in evaluating the community's assets and liabilities and in developing suggestions for improving the environmental, social and economical future of Kaycee.

The Resource Team toured the town and interviewed approximately two hundred and thirty people over a three-day period from January 12-14, 2004. Each participant was asked a series of three questions designed to begin communication and discussion and to serve as the basis for developing the action plan. The following are some highlights from these questions with regard to the flooding issue:

1. What are the major problems and challenges in your community?
    - Flooding – Ways to keep our feet from getting wet again
    - River Mitigation
    - Flood Mitigation
    - Flood Control
    - The last flood took a real toll and changed the appearance of downtown
    - Since the flood, the community appearance has gone down
    - The flood pushed the town mentally and physically
    - Lots of problems are left over from the flood

- Hard feelings about the money people got as a result of the flood

2. What projects would you like to see implemented in your community in the next two, five, ten, or twenty years?
   - Storage Reservoir/Dam
   - Build levy to hold creek or at least see if it is feasible
   - Flood mitigation projects
   - Clean-up along the river
   - Anti-flood measures

The main topic that was discussed in this report is keeping the town alive. Kaycee is a wonderful community with a lot of history that needs to be maintained.

Town Hall Meeting identified projects the town wants to work on which included Flood Protection.

Community Assessment

An evaluation of the community's readiness/acceptance of change was conducted. The people represented in the focus groups certainly understand and acknowledge that there will be change – they've seen it in a devastating manner with the flood, and are continuing to see it as the community goes through the long process of rebuilding. New businesses have opened or are in the process of opening, clean-up has re-instilled a sense of community pride which many folks would like to expand upon, and there is an awareness that something has to change to ensure a future for Kaycee – as indicated in the commitment to buy locally (aftermath of losing the grocery store) and an awareness of changes in the school (declining enrollment in the grade school and discussion surrounding combining classes). The awareness is certainly there, and in fact a general agreement, voiced or not voiced, that something will have to be done to ensure Kaycee's future.

There also is within the community a strong sense of community attachment and pride and frankly some of the strongest people I've yet to meet. Energy flowed in each session with ideas, suggestions, a sense of survival at all costs and independence. There is passion and commitment connected with how people feel about this town – new residents as well as long-time residents; young and old. There is also, in spite of what I heard in relationship to some of the on-going or newly created conflicts, an underlying sense of trust within this town, which included those folks whose addresses fell outside the boundaries of Kaycee proper. This sense of trust is an important piece when assessing a community.

The people who participated in the focus groups understood that ready or not, something has to be done to ensure the towns future. This point was probably made real by things that have occurred this year with the schools: discussion of combining classrooms and fewer students in the grade school. There was an awareness that younger families will need to be "recruited" to live in Kaycee, and along those lines that people will need to be made a part of the community. There is, however, also a very real fear of growth. For many, growth is the fear that means losing the essence of what makes Kaycee, Kaycee. It means losing control of that essential "thing" that makes this community so special. And while that does not have to occur, the fear is there. Communication – thorough, constant communication is essential in getting rid of these fears.

Kaycee Demographics

Kaycee, Wyoming was established in 1900 and is rich in the Old West tradition and history. The name of the town came from the KC Ranch where rancher/rustler Nate Champion held off the Johnson County War invaders for most of a day. Close by is the famous Hole-in-the-Wall and Outlaw Cave where Butch Cassidy and the Sundance Kid found safe refuge. Kaycee also boasts of the Bozeman Trail that linked the Oregon Trail to the Montana gold mines.

Natural resources are plentiful in this location -- mountains, lakes and the natural beauty that comes with that support such outdoor sports as hunting, fishing, cross-county skiing, snowmobiling.

Along with those natural amenities, agriculture, mining and oil have all historically helped to develop and continue to support Kaycee. The population is very engaged in community and is somewhat self-sufficient with over 1/4 of the overall population being self-employed in 1999. The community is proud of their rich history and traditions. The community of 249 supports a museum, a branch library and is the smallest town to host a Professional Rodeo Cowboy's Association rodeo. Community involvement is further supported by voluntary organizations, and given the number of people, is quite substantial. The community sustains several organizations which include a Lions Club, Kaycee FFA Alumni Association (which networks with youth by its strong support of the high school FFA), Grange and three female-specific groups/clubs.

The population of 249 has remained fairly constant (though down by 35 from 1960) over the last 40 years. Declining population as seen in other small rural communities, does not seem to be a big issue here, and with a median age of 36.8 appears as though it will continue to sustain itself. Many towns of this size are also seeing trends toward older populations; only 12% of the overall population of Kaycee is 65 years and older.

Ninety-eight percent (98%) of the population was reported as White in both the 1990 and 2000 census figures. Ancestry is primarily German and English, though that has changed in the last ten years. In 1990, 30% of Kaycee's population claimed German as their ancestral background; in 2000, only 12.6% made the same claim. There was also a marked increase in the numbers who claimed United States as their ancestral heritage: 6% in 1990 and 23% in 2000.

Another indicator of strong tie-in to community is reflected in the following. Almost 70% of Kaycee's residents were born in the state of Wyoming as compared to only 49% of Johnson County's residents and 42% of the state making that same claim. Most of the people who live in Kaycee are homeowners. Age of homes also reflects the historical pride they have - 30% of the homes in town were built in 1939 or before. The median value of homes in the area in 1999 was $58,800. This compares to median values of $115,500 for Johnson County and $96,600 for the state. Median household income was reported at $33,056 for Kaycee as compared to $34,012 for Johnson County and $37,892 for Wyoming. Ten and nine-tenths percent (10.9%) of the families in Kaycee lived in poverty in 1999. This compares to 7.2% for Johnson County and 8% for the state of Wyoming for the same period of time.

Educational levels have improved greatly since 1990. According to the 1990 Census, 63.5% were high school graduates and 14.4% received a bachelor's degree or higher. In 2000 that had

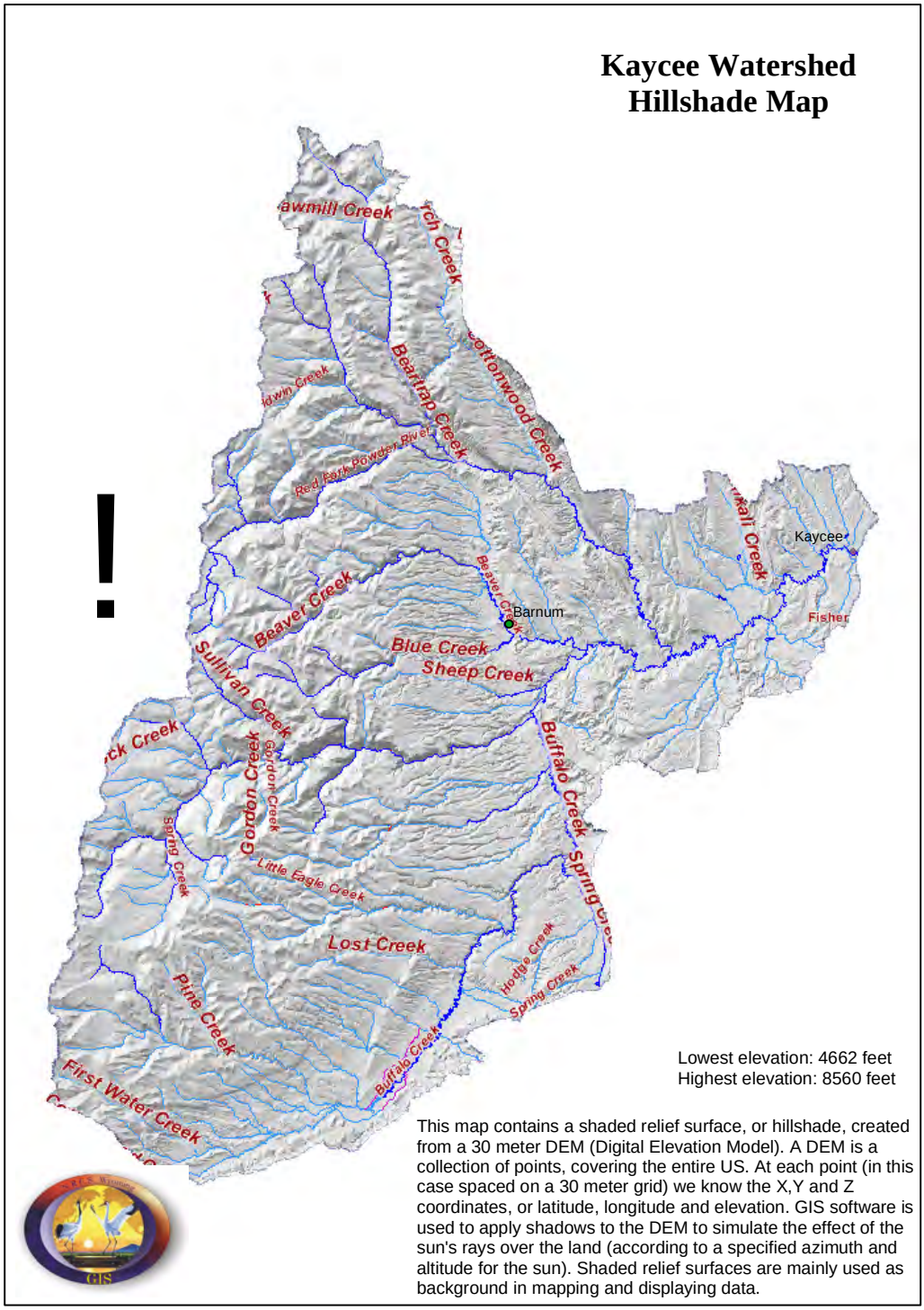
increased to 86.9% with a high school diploma and 17.6% of the population having received a bachelor's degree or more.

Agriculture is important in Kaycee. The town boasts on their website of having four cattle breeders who hold annual production sales. Numbers of farms have increased over the last ten years as reported in the Agricultural Census. In 1987 there were 272 farms; 315 reported in the 1997 Ag Census. Farms sized 10-179 acres and 1,000 + acres accounted for this number increase. Average age of producer is 53 and 10% of the owners were reported as female.

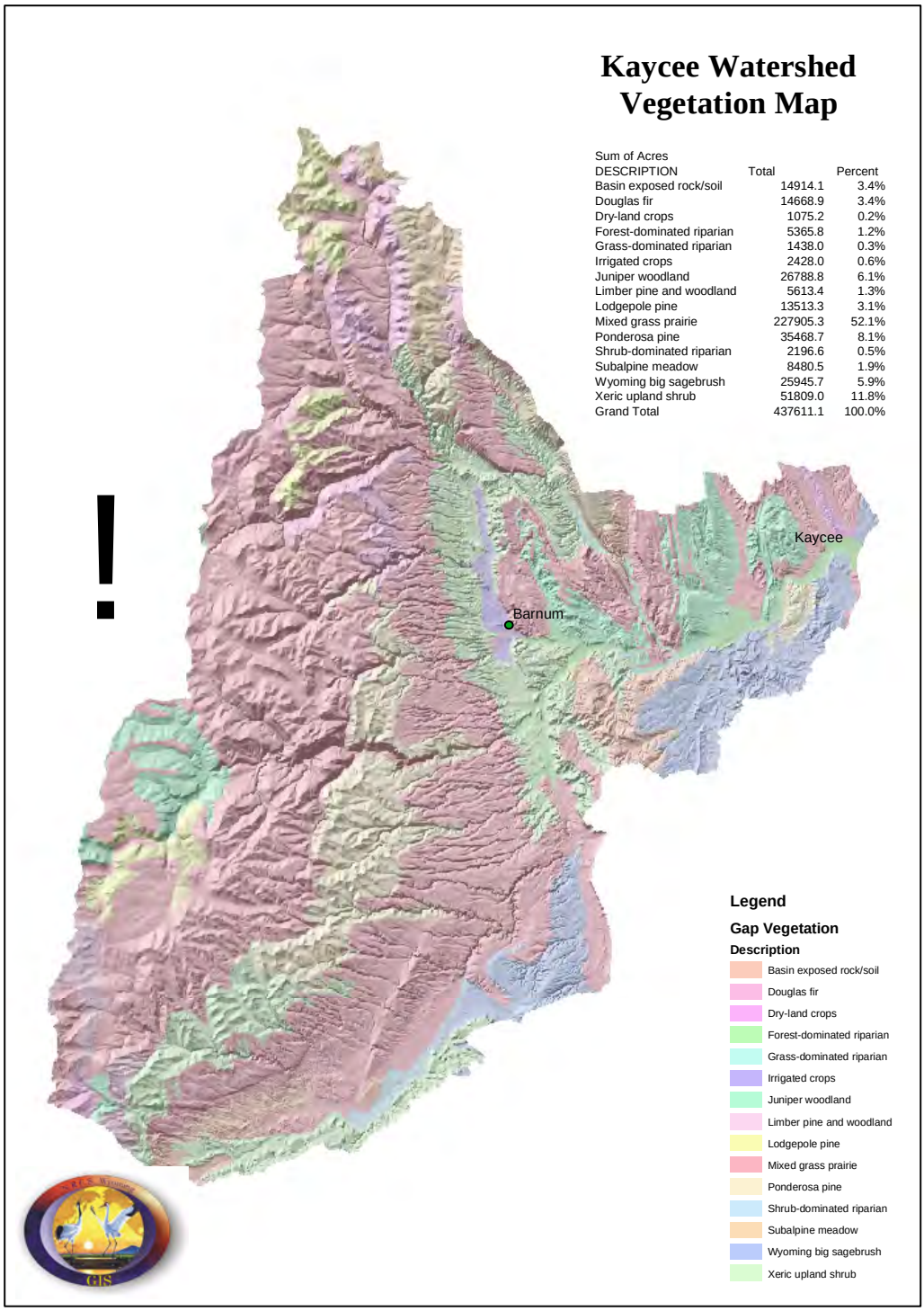
By looking only at demographics, this would appear to be a tightly knit community that has a great deal of community pride as well as sustainability. It is rich in history and appears as though it will continue to sustain itself since there is a good range of ages represented. A large number of residents are self-employed and the community has strong volunteer support that values community and works hard to sustain it. The tie-in to youth that has been made by the Kaycee FFA Alumni Association and the Lions Club also shows belief in the future and a strong commitment to it.

Appendix C - Maps

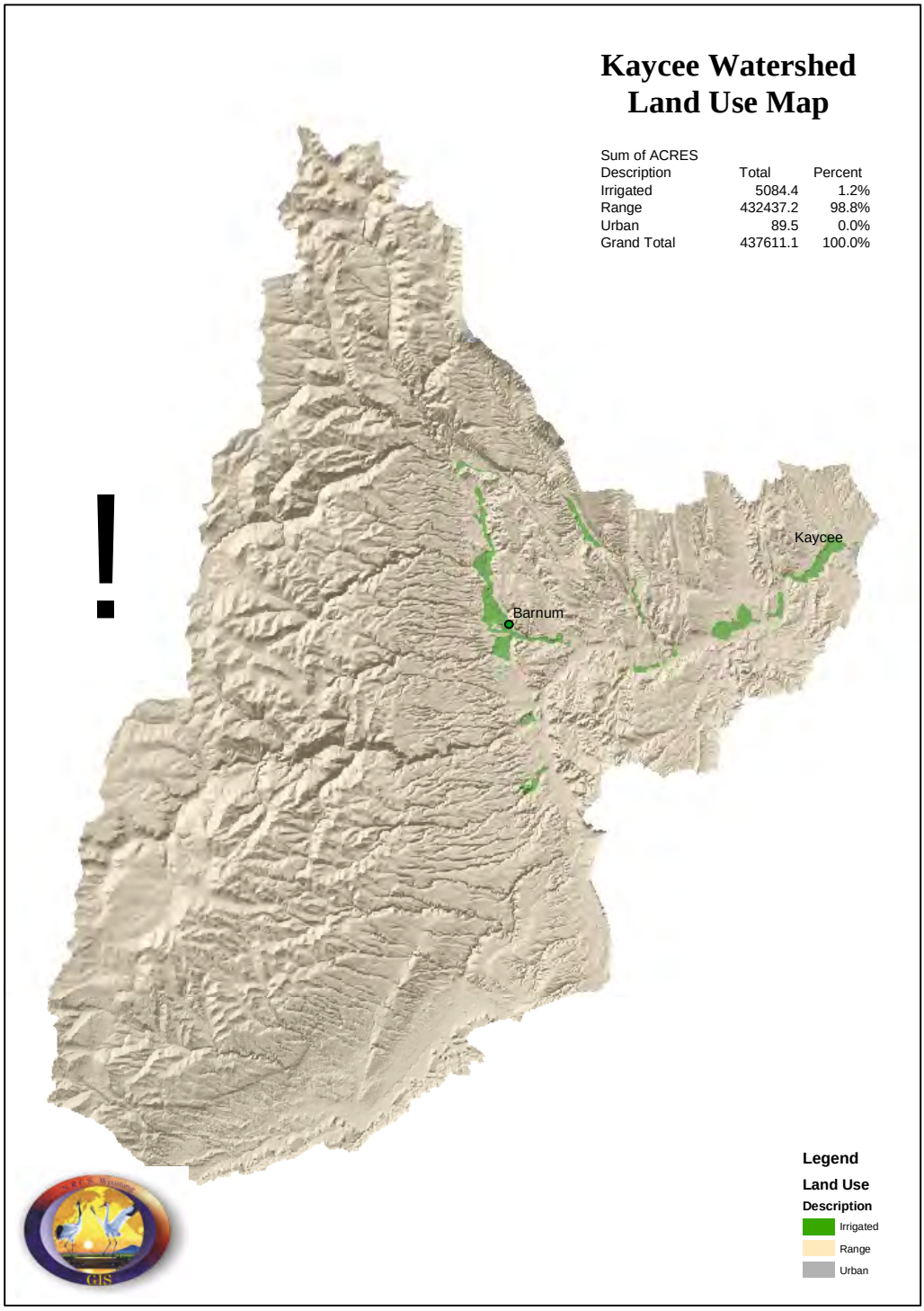
Hillshade Map



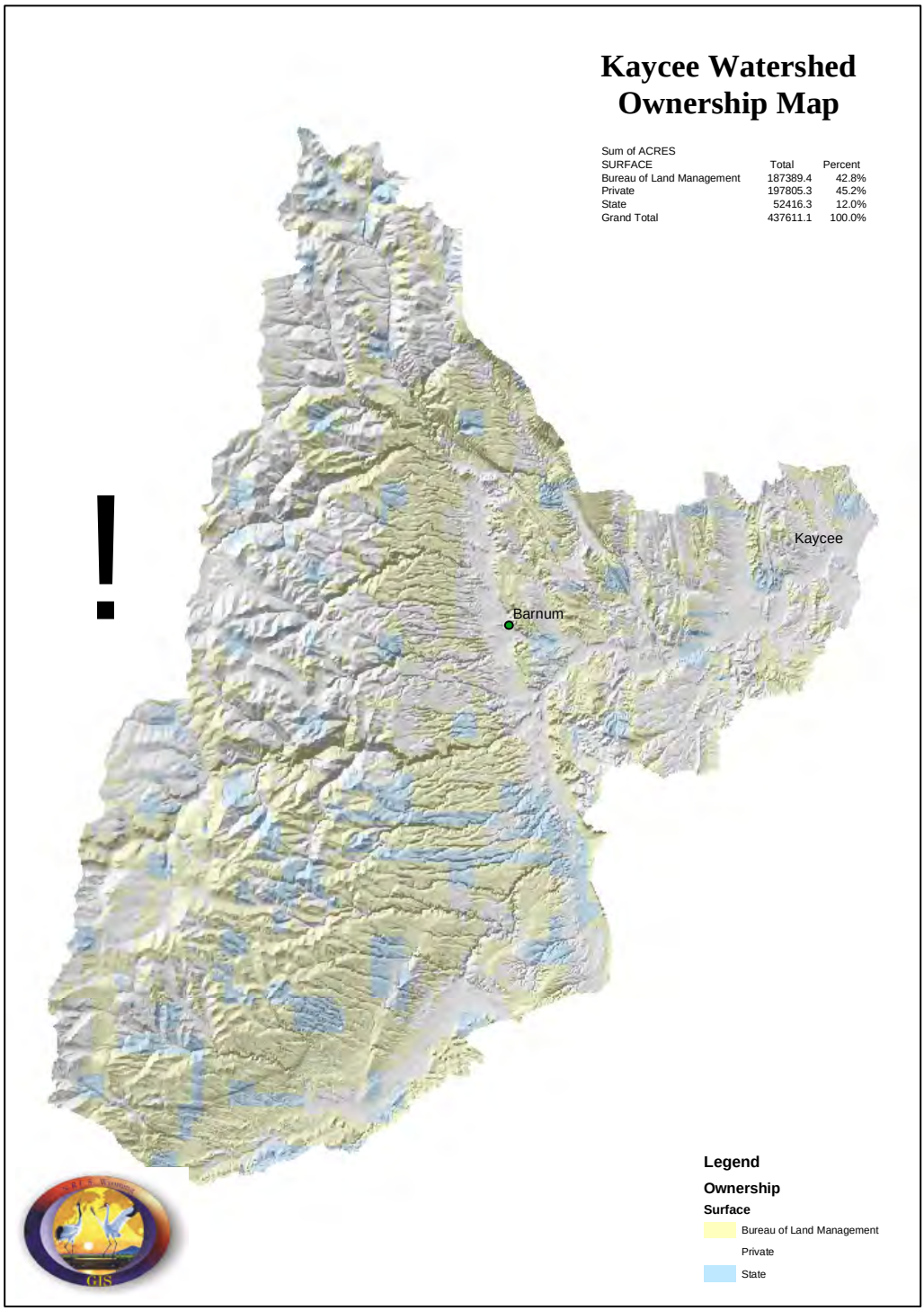
Vegetation Map



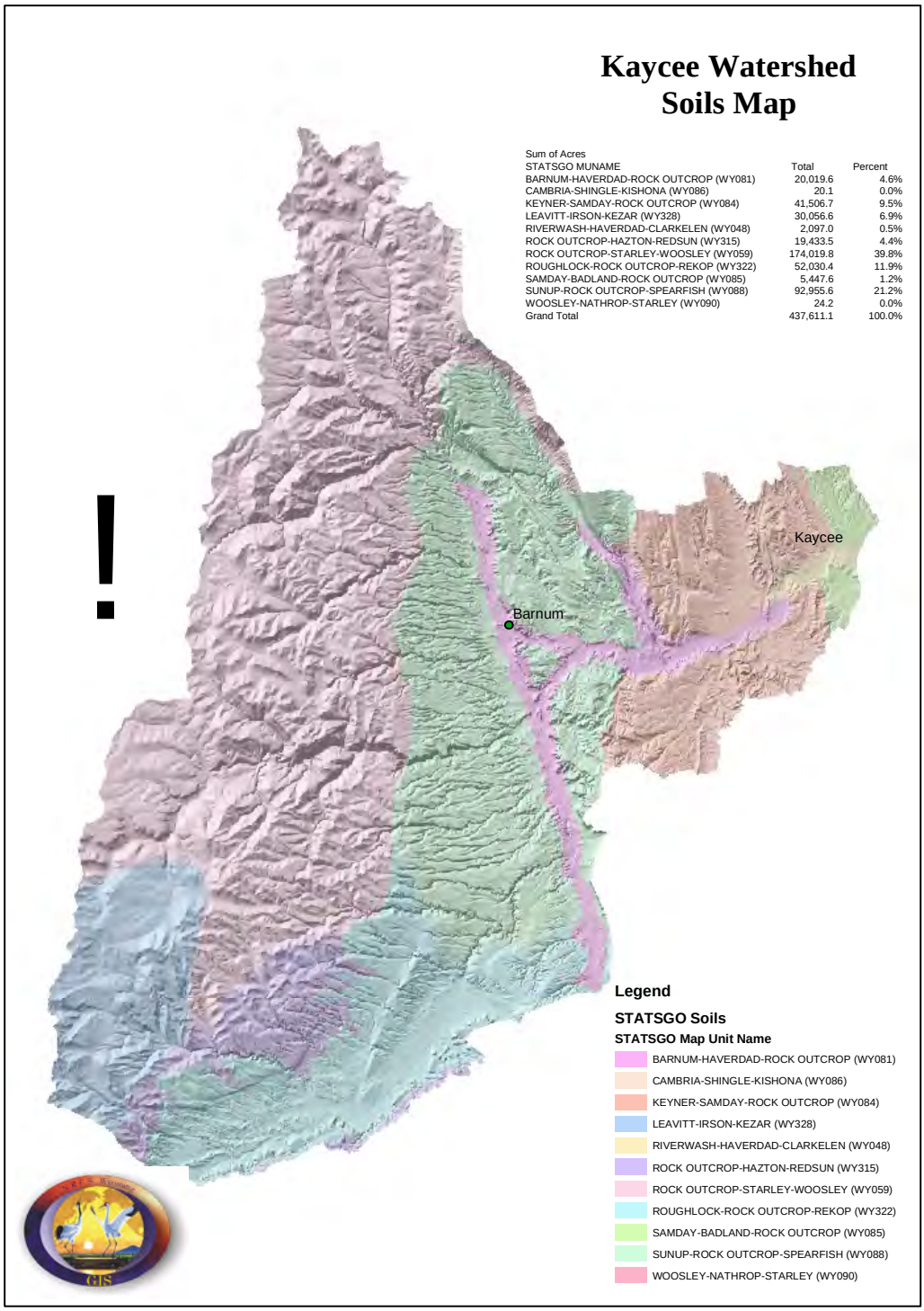
Land Use Map


Kaycee Watershed
Land Use Map
Sum of ACRES
Description Total Percent
Irrigated 5084.4 1.2%
Range 432437.2 98.8%
Urban 89.5 0.0%
Grand Total 437611.1 100.0%
Barnum
Kaycee
Legend
Land Use
Description
Irrigated
Range
Urban

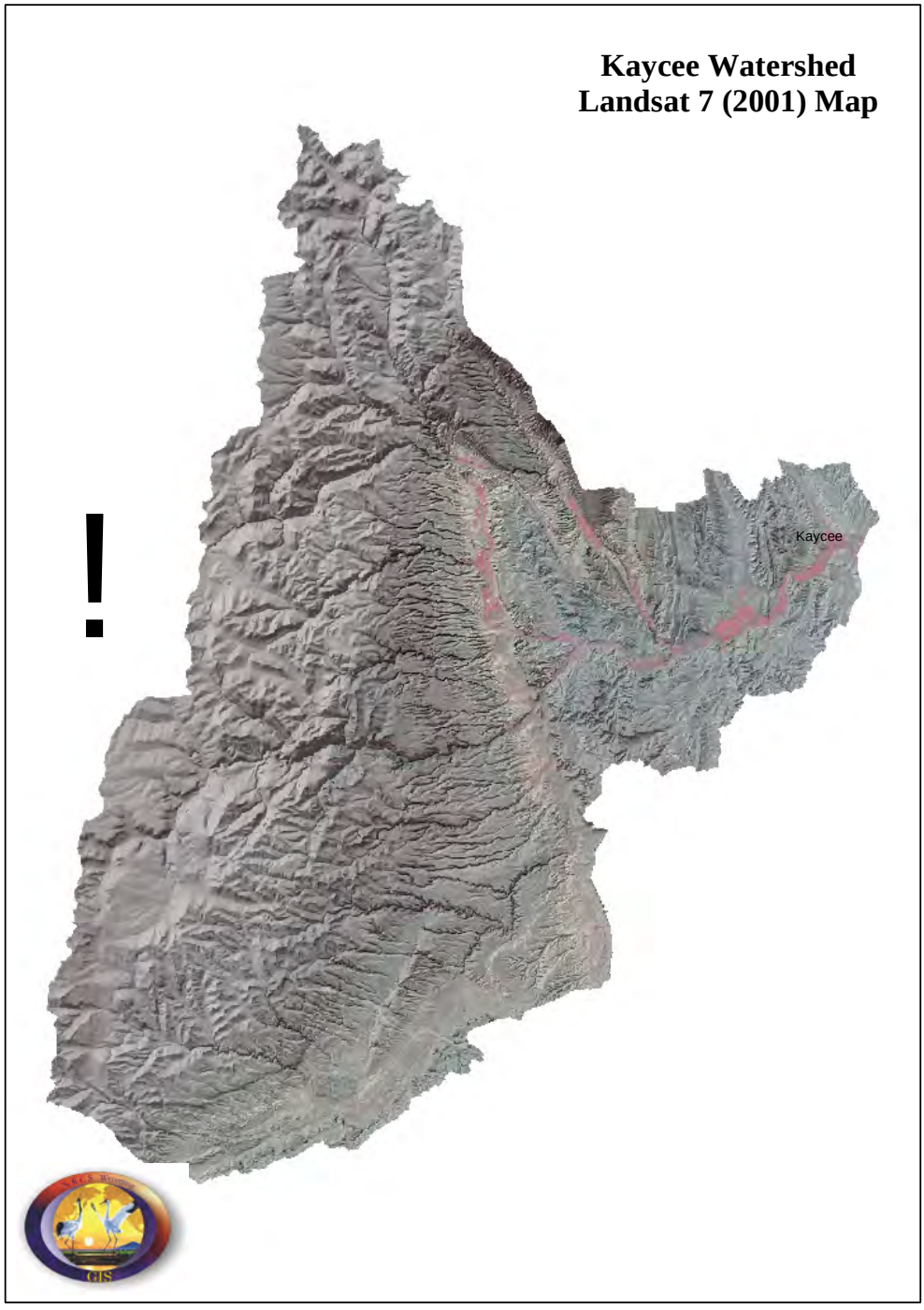
Watershed Ownership Map



Watershed Soils Map



Landsat 7 (2001) Map



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Appendix D – U.S. Army Corps of Engineers Hydraulic Analysis Report (as attached)

Appendix E – U.S. Army Corps of Engineers Economic Analysis

Problem Identification

The identification of the severity of the flood problem is a critical first step in the economic analysis. It is necessary in order to determine if a sufficient problem exists to justify Federal involvement. The magnitude of the flooding problem is estimated utilizing a computer flood damage model. Inputs to the model are developed and used to compute estimated flood damages for specific floods and to estimate the expected annual flood damage (EAD). Inputs to the model include information on the frequency and depth of flooding, the type, value and elevation of structures, the value of structure contents, and flood damage curves for structure damages and content damages.

Land Use Survey. A land use survey was completed for the Middle Fork of the Powder River floodplain in the Kaycee, Wyoming area. The flood plain was subdivided into four subareas for data management and plan formulation purposes. These areas extend from the outer edge of the floodplain to the boundaries described below.

Subarea 1- North of the Middle Fork of the Powder River and west of Main Street (Nolan Avenue).

Subarea 2- North of the Middle Fork of the Powder River and east of Main Street.

Subarea 3- South of the Middle Fork of the Powder River and west of Main Street.

Subarea 4- South of the Middle Fork of the Powder River and east of Main Street.

Land use data was collected and structure values estimated by the Natural Resource Conservation Service (NRCS). The first floor elevation of each structure was surveyed and each structure value reflects the estimated depreciated replacement value. All potentially flooded real estate was considered.

Sixty-four percent of the structures in the floodplain are residential in nature, with the remaining thirty-six percent classified as commercial. The majority of residential structures are conventional single-family residences without basements and mobile homes. There are a variety of commercial structures impacted by flooding and these are located throughout the floodplain. The number of structures flooded by event, for the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year events are presented in Table 1.

Table 1: Number of Buildings Damaged:			
Event	Residential	Commercial	Total
2 yr. Flood	7	1	8
5 year Flood	19	3	22
10 yr. Flood	20	9	29
25 yr. Flood	22	14	36
50 yr. Flood	26	18	44
100 yr. Flood	31	23	54
500 yr. Flood	47	26	73

Structure Values. The depreciated replacement values for conventional structures were estimated based on structure size, age, condition, and type of construction. The values of mobile homes, double wide and modular hosing units were based on actual values and the type of foundation.

Content Values. The NRCS and Omaha District collectively estimated structure content values. Generally 50 percent of structure value was used for the content value of residential structures. However, a sliding scale was used for mobile home contents, which normally have a greater percentage of content value than conventional residential structures.

Total content and structure values by residential and commercial uses are presented for all structures within the 500-year flood plain in Table 2. These figures do not reflect the value of associated uses, which are estimated at approximately 25 percent of structure value for residential. Associated uses include small-detached garages, autos, and yard improvements likely to be damaged by flooding.

Table 2
Value of Structures and Contents by Type
500-year Flood Plain Area

Table 2: Existing Conditions			
Number of Buildings Damaged			
Type	Structure Value	Content Value	Total Value
Residential	$1,713,300	$985,150	$2,698,450
Commercial	$775,500	$669,150	$1,444,650
Total Value	$2,488,800	$1,654,300	$4,143,100

Flood Damage Model. The Omaha District Newark4 flood damage computer model was used to calculate flood damages by event and to estimate EAD. Input to the model included flood stages by station and event, land use data, and the district's SIMUL flood damage curves for different land use types. Flood stages for the 2-, 5-, 25-, 50-, 100-, and 500-year events provided by the Hydrologic-Hydraulic Analyses done as part of this study were used. The 1.5-year event was also done as part of the hydraulic analysis, but was not included because it is believed no appreciable damage results from this event.

Flood Damage Estimate. As shown by the model, limited flooding starts in subareas 1, 2 and 3 as early as the 2-year event. Moderate Damages occur between the 2-year and 50-year events,

and more significant damage occurs after the 50-year event affecting up to 73 structures in the 100 to 500-year event. Subarea 4 has minimal damages during all flood events.

Total flood damages for commercial and residential structures and contents, by event, are presented in Table 3.

Table 3
Flood Damages to Structures and Contents
By Classification and Event

	Table 3: Existing Conditions		
Event	Residential Damage	Commercial Damage	Total Damage
2 yr. Flood	$46,853	$61	$46,914
5 year Flood	$153,029	$981	$154,010
10 yr. Flood	$337,834	$19,595	$357,429
25 yr. Flood	$487,663	$75,199	$562,862
50 yr. Flood	$610,906	$110,351	$721,257
100 yr. Flood	$691,645	$180,792	$872,437
500 yr. Flood	$1,211,859	$559,501	$1,771,360

The EAD is computed taking both the severity of flood events and their probability of occurrence into consideration. Based on this analysis, EAD for the Kaycee study area is $116,486.

Economic Analysis of Potential Alternatives

Flood damages prevented by a project accrue as National Economic Development (NED) benefits to the project. Two additional categories of potential NED benefits that could affect project feasibility are those for local flood-related expenditures, such as infrastructure damages repair and emergency management and cleanup costs, and for administrative cost savings for the National Flood Insurance Program (NFIP). The latter will accrue to a project having a 100-year or greater level of protection. In the instance of levees, normally a 100-year level of protection plus an additional three feet of freeboard are required. Infrastructure damages, associated costs, and emergency management costs are normally computed to be 16.5 percent of damages to structures and contents for initial assessments. However in this instance infrastructure damages were based on losses experienced by the City of Kaycee during its recent flood. These losses were reported to be $204,600. For purposes of this analysis it was assumed that the recent flood was approximately a 100-year event. Based on the losses reported by the city and flood damages estimated by the Corps of Engineers, damages to infrastructure are estimated to be 22 percent of total damages to structures and contents. Consideration of these damages and costs increase benefits by about 22 percent. With regard to NFIP administrative savings, a project providing 100-year or greater protection to the total flood plain would generate an annual savings to the Federal government for policy administration of $161 each based on Economic Guidance Memorandum 04-04, dated 9 of April 2004. In this instance, a 100-year project could remove an estimated 54 structures from the NFIP, generating an annual government savings benefit of $8,694. Annual NED benefits of non-specified flood control projects providing various levels of protection were roughly calculated and are presented for the total flood plain and by subarea in Table 4.

Table 4: Estimated Annual Flood Damage Reduction Benefit, Capitalized Present Value

Subarea 1	Annual Benefit	Infrastructure	NFIP Savings	Total Annual Benefits	Capitalized Present Value of Protection
2 year Protection	0	$170	$0	$170	$2,932
5 year Protection	771	$631	$0	$1,402	$24,180
10 year Protection	2866	$1,570	$0	$4,436	$76,508
25 year Protection	$7,136	$2,178	$0	$9,314	$160,640
50 year Protection	$9,899	$2,600	$0	$12,499	$215,572
100 year Protection	$11,819	$3,103	$805	$15,727	$271,246
500 year Protection	$14,103	$3,255	$805	$18,163	$313,260
Flood Damage Elimination	$14,795	$3,255	$805	$18,855	$325,195
Subarea 2					
2 year Protection	$0	$0	$0	$0	$0
5 year Protection	$10,035	$2,208	$0	$12,243	$211,157
10 year Protection	$14,438	$3,176	$0	$17,614	$303,791
25 year Protection	$17,482	$3,846	$0	$21,328	$367,847
50 year Protection	$18,878	$4,153	$0	$23,031	$397,219
100 year Protection	$20,383	$4,484	$1,932	$26,799	$462,206
500 year Protection	$23,600	$5,192	$1,932	$30,724	$529,901
Flood Damage Elimination	$25,115	$5,525	$1,932	$32,572	$561,774
Subarea 3					
2 year Protection	$0	$0	$0	$0	$0
5 year Protection	$18,228	$4,010	$0	$22,238	$383,542
10 year Protection	$37,099	$8,162	$0	$45,261	$780,623
25 year Protection	$57,029	$12,546	$0	$69,575	$1,199,970
50 year Protection	$65,576	$14,427	$0	$80,003	$1,379,823
100 year Protection	$70,393	$15,486	$2,254	$88,133	$1,520,043
500 year Protection	$74,737	$16,442	$2,254	$93,433	$1,611,452
Flood Damage Elimination	$75,902	$16,698	$2,254	$94,854	$1,635,961
Subarea 4					
2 year Protection	0	$0	$0	$0	$0
5 year Protection	35	$8	$0	$43	$742
10 year Protection	$105	$23	$0	$128	$2,208
25 year Protection	$203	$45	$0	$248	$4,277
50 year Protection	$247	$54	$0	$301	$5,191
100 year Protection	$271	$60	$0	$331	$5,709
500 year Protection	$503	$111	$0	$614	$10,590
Flood Damage Elimination	$674	$148	$0	$822	$14,177
All Areas					
2 year Protection	$0	$6,395	$0	$6,395	$162,037
5 year Protection	$29,069	$11,992	$0	$41,061	$708,185
10 year Protection	$54,508	$12,931	$0	$67,439	$1,163,130
25 year Protection	$81,850	$20,812	$0	$102,662	$1,770,626
50 year Protection	$94,600	$21,234	$0	$115,834	$1,997,806
50 yr. Protection, 100 yr. Freeboard	$98,733	$21,721	$0	$120,454	$2,077,487
100 year Protection	$102,866	$23,133	$4,991	$130,990	$2,259,203
100 yr. Protection, 500 yr. Freeboard	$107,905	$23,739	$4,991	$136,634	$2,356,546
500 year Protection	$112,943	$25,000	$4,991	$142,934	$2,465,203
Flood Damage Elimination	$116,486	$25,627	$4,991	$147,104	$2,537,124

All Subareas Notes:

(1) Infrastructure, emergency management and cleanup costs are estimated to be 22 percent of flood damages to structures and contents.
(2) National Flood Insurance Program (NFIP) administrative savings are estimated at $161 for each policy no longer required with a 100-year event or greater level of flood protection in place.
(3) Benefits capitalized over a period of 50 years at an annual discount rate of 5.375 percent.

The capitalized values of potential NED benefits provide a rough estimation of project cost, which can be justified for the specified level of flood damage protection. Capitalized future operation and maintenance (O&M) costs must also be incorporated into project cost to provide a correct comparison. These projects would have a benefit to cost ration (BCR) of 1.0 or greater if total project costs do not exceed the capitalized benefit listed. A BCR of 1.0 or higher is required for a finding of Federal interest. It is noted these figures are presented as an indication of the level of construction, including all economic costs, which might be justified. The steps required for an actual determination of economic feasibility are significantly more complex. The capitalized NED benefits roughly estimated for various levels of protection for the entire floodplain and by subarea are presented in Table 4 as well.

As shown in table 4, a project with a capitalized cost of about $2.5 million dollars could be constructed, provided it would eliminate all flood damage in the Kaycee floodplain. Lesser projects may be feasible on a community wide or sub areas basis. The potential NED benefits for subarea 4 are small and no flood control option is likely for that area by itself.

Economic Analysis of Specific Alternatives

Alternative A – No Action. Under this alternative conditions would remain the same as described in the Problem Identification above. The EAD for structures and contents would be $116,486. Additional losses to infrastructure and for flood insurance administration would be experienced.

Alternative B – Upstream Detention. Upstream detention was found to be infeasible do to high cost by a wide margin and a detailed economic analysis is not warranted. See main report.

Alternative C – Levees. Levees on both the left (north) and right (south) banks were considered. Three left bank alignments were evaluated on. These are levee alignments A, B, and C. One alignment was considered on the Left bank – the South levee. The levees were sized to provide protection from the 100-year event with an additional three feet of freeboard. The freeboard would allow additional flood protection to approximately the 500-year event. A levee with this level of protection and amount of freeboard is required to remove the protected area from the designated Federal Emergency Management Agency (FEMA) flood hazard area.

Construction costs - Cost estimates and hydraulic analyses were prepared for all three alignments. Construction costs for alignments A, B and C are $1,582,436, $1,576,149 and $1,528,472 respectively. A factor contributing to the similar costs is that the South levee is required by all three left bank alignments. This is due to the potential for induced flooding that would result from narrowing the flood plain. Although somewhat shorter, alignments B and C, which are set back further from the channel than alternative A, would require additional real estate to mitigate induced flooding to property located between the Left and Right bank structures. Additionally, alignments B and C would protect fewer structures than A. Based on the need for extensive additional real estate and the fewer structures protected alignments B and

C are eliminated and Alignment A is selected as being the most feasible and given additional consideration, including an economic analysis.

The South Levee construction cost was not included directly in the M-CACES estimate. However it was easily estimated by breaking out the cost of construction, $305,648 and adding contingency, Planning, Engineering and Design, and Construction Management costs. With these additions the cost is $377,648.

Real estate costs - Real estate costs were roughly estimated for Alignment A and the South levee based on the number of structures taken, area of the footprint of the levee, acquisition costs and a 30 percent contingency. The computations showing the basis of these estimates are contained in attachment 1. Estimated real estate costs are presented in table 5.

Table 5
Estimated Real Estate Costs

Alignment A - only	Cost
Structures and Lots	$274,200
Undeveloped Land	$231,000
Acquisition Cost	$ 60,000
Sub Total	$565,200
Contingency (30%)	$169,560
Total Cost Alignment A	$734,760

South Levee	Cost
Structures and Lots	$180,500
Undeveloped Land	$ 70,000
Acquisition Cost	$ 60,000
Sub Total	$310,500
Contingency (30%)	$ 93,150
Total Cost South Levee	$403,650

Total Real Estate Cost Alignment A	
Alignment A only	$ 734,760
South Levee	$ 403,650
Total cost	$1,138,410

Total project cost – total project first cost, including both construction and real estate are shown for Alignment A and the South Levee in table 6.

Table 6
Estimated Project Costs

Alignment A	Cost
Construction	$1,582,436
Real Estate	$1,138,410
Total Cost	$2,720,846

South Levee	Cost
Construction	$377,648
Real Estate	$403,650
Total Cost	$781,298

Economic costs – these costs include construction, real estate, interest during construction (IDC), interest, and operation and maintenance (O&M). The costs are self-explanatory except for IDC, which is the opportunity cost of the capital tied up during construction before the project accrues income. In this instance, the income stream is NED flood damage reduction benefits. IDC is computed for construction and real estate expenditures. The IDC computation assumes a one-year construction period, including land acquisition, and an average of one half the total cost expended over the year. An annual interest rate of 5.375 percent is used. IDC is $73,100 and $21,000 for Alignment A and the South Levee respectively. A nominal annual expenditure of $5,000 is assumed for O&M for each project. Accordingly, O&M is $10,000 annually for the Alignment A project, which includes the South Levee.

Benefit Cost Analysis – the economic costs and economic benefits of Levee Alignment A and the South Levee, along with BCRs, net annual benefits and the net present value of benefits are presented in table 7 below.

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Table 7
Benefit Cost Analysis

Levee Alignment A	Cost
Construction and Real Estate	$2,720,846
IDC	$ 73,100
Total	$2,793,946
Annual Costs	
Interest and Amortization (1)	$161,995
O&M	$ 10,000
Total	$171,995
Annual Benefit (2)	
Flood Damage Reduction (100-yr levee)	$123,154
Freeboard Benefit (500-yr freeboard)	$ 7,318
NFIP Administration Savings	$ 4,991
Total	$135,463
Benefit to Cost Ratio	0.79
Net Annual Benefit	($36,532)
Present Value Net Benefit	($630,073)
South Levee	Cost
Construction and Real Estate	$781,298
IDC	$ 21,000
Total	$802,298
Annual Costs	
Interest and Amortization (1)	$46,518
O&M	$ 5,000
Total	$51,518
Annual Benefit (2)	
Flood Damage Reduction (100-yr levee)	$86,210
Freeboard Benefit (500-yr freeboard)	$ 2,791
NFIP Administration Savings	$ 2,254
Total	$91,255
Benefit to Cost Ratio	1.78
Net Annual Benefit	$39,737
Present Value Net Benefit	$685,350

Notes Table 7:
(1) Costs amortized over a 50 year project life at an annual interest rate of 5.375 percent.
(2) Alignment A accrues benefits from subareas 1,2, 3 and 4. The South Levee accrues from 3 and 4.

As shown in table 7, Alignment A is infeasible by a wide margin with a BCR of 0.79 and a negative net present value of benefits of over seven hundred thousand dollars. In as much as the South Levee is feasible and not dependent on a structure on the opposite bank, the correct method of analyzing the left bank, or north side Alignment A levee would be an incremental analysis. Using this approach, levee Alignment A would be considered as an added increment to the South Levee. Accordingly only benefits from subareas 1 and 2 would accrue to the project (benefits from subareas 3 and 4 having already been accrued to the South Levee) and it would be infeasible by an even wider margin, with a BCR of 0.38.

The South Levee has a BCR of 1.78 and a present value of net benefit (capitalized value of annual benefit minus annual cost) of over $685,000. Either the cost estimate would have to be understated or the benefits would have to be overstated by roughly this amount before the project would be infeasible. The South Levee has the greatest net benefit and is the NED alternative.

Appendix E Attachment 1 - Real Estate Cost Estimate

Kaycee, WY Section 205 (current 9/3/04)
Land Requirement - Alignment A and South Levee

	Structure Type (1)	Structure Value (1)	Land Value (2)
Alignment A	Mobile home	$ 15,000	$ 10,000
	Out building	$ 1,000	$ 5,000
	Residential w/basement	$ 14,000	$ 20,000
	Residential w/basement	$ 100,000	$ 20,000
	Residential no/basement	$ 58,500	$ 20,000
	Cabin	$ 700	$ 10,000
		$ 189,200	$ 85,000

Combined cost $ 274,200

Land without structures	Designed Length	Length Used	
Length	3,600	3,300	feet (3)
Width	50	70	feet (4)
Area		231,000	sq. ft.
Acres		5.30	
Sub total		$ 231,000	(5)
Structures and lots		$ 274,200	
Land/ROW		$ 231,000	

Acquisition cost (6)

6 structures and lots	$ 30,000
6 parcels	$ 30,000
	$ 60,000

Alignment A only - total

Structures and lots	$ 274,200
Open Land	$ 231,000
Acquisition cost	$ 60,000
Sub total	$ 565,200
Contingency (30%)	$ 169,560
Total cost	$ 734,760

South Levee

Cabin	$ 1,000	$ 5,000
Cabin	$ 1,000	$ 5,000
Cabin	$ 1,000	$ 5,000
Doublewide	$ 50,000	$ 20,000
Mobile home	$ 20,000	$ 5,000
Mobile home	$ 18,000	$ 5,000
Mobile home	$ 17,000	$ 5,000
Mobile home	$ 17,500	$ 5,000
	$ 125,500	$ 55,000

Combined value $ 180,500

Land without structures	Designed Length	Length Used	
Length	1,400	1,000	feet (3)
Width	50	70	feet (4)
Area		7,0000	sq. ft.
Acres		1.61	

Sub total $ 70,000 (5)

Acquisition cost (6)

8 structures/lots	$ 40,000
4 parcels	$ 20,000
	$ 60,000

Alignment South Levee - Total

Structures and lots	$ 180,500
Land and ROW	$ 70,000
Acquisition cost	$ 60,000
Sub total	$ 310,500
Contingency (30%)	$ 93,150
Total cost	$ 403,650

Real Estate Cost South Levee **$ 403,650**

Real Estate Cost Levee Alignment A

Alignment A	$ 734,760
South Levee	$ 403,650
Total Cost	**$ 1,138,410**

Notes/assumptions:

(1) Structure type, and value taken from land use survey.

(2) Land value assumes $20,000/lot for conventional single family residence, $10,000 for mobile homes, and $5,000 for small cabins and small outbuildings.

(3) Undeveloped land requirement based on design is reduced by 50 feet for each structure taken.

(4) Assumes an additional 20 feet in width for access to slopes.

(5) Land cost at $1/square foot.

(6) A $5,000 acquisition cost is assumed for an estimated 12 parcel.

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Appendix F - U. S. Army Corps of Engineers Nonstructural Flood Damage Assessment
(as attached)