Progress Report

Green River Watershed Native Non-Game Fish Species Research: Phase II

Agreement Number 02-FC-40-6870

Bluehead sucker (*Catostomus discobolus*)

Flannelmouth sucker (*Catostomus latipinnis*)

Roundtail chub (*Gila robusta*)

June 2004

Progress Report

Green River Watershed Native Non-Game Fish Species Research: Phase II

Submitted to:

Bureau of Reclamation

Submitted by:

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INTRODUCTION

Currently, little is known about the native fish assemblages present in the Green River drainage of southwestern Wyoming. Of particular interest are the bluehead sucker (BHS), flannelmouth sucker (FMS), and the roundtail chub (RTC).

Bluehead sucker, FMS, and RTC have declined in Wyoming and throughout their native ranges. The Natural Heritage Program assigns BHS the global ranking of G4 suggesting its existence to be abundant and globally secure, although it may be quite rare in parts of its range and is thus the element of long-term concern (Fertig and Beauvais 1999). The Natural Heritage Program assigns FMS the global ranking of G3/G4 suggesting its existence to be uncertain. It is uncommon but seems to be locally secure. The Natural Heritage Program assigns the RTC the global ranking of G3 suggesting its existence to be very rare throughout its range or locally abundant but highly restricted.

The BHS is classified by the Wyoming Game and Fish Department (WGFD) as an NSS1 species, indicating that it is rare and its habitat is declining or vulnerable. The FMS and RTC are classified by the WGFD as NSS2 species indicating that they are rare, but their habitat is stable. Surveys conducted by Baxter (Baxter and Simon 1970) and Wheeler (1997) represent the only drainage-wide efforts conducted in the Green River drainage of Wyoming. The most recent surveys conducted by Wheeler (1997) showed that between 1965 and 1995 all three species had declined at three spatial scales (site, stream, and sub-drainage) in the Green River drainage of Wyoming. He did not find BHS in the Green River drainage in 1995, and only found RTC in the Blacks Fork drainage. Flannelmouth sucker were documented throughout the Green River drainage in 1995, but were not collected in the Little Snake River drainage (Wheeler 1997).

Additional sub-drainage surveys have been conducted in the Bitter Creek drainage (Carter and Hubert 1995) and in the Big Sandy River drainage (Miller 1978). Bluehead sucker and RTC were not collected in the 1993 Bitter Creek survey, but FMS were collected from a site near the Bitter Creek-Green River confluence (Carter and Hubert 1995). Miller (1978) reported on a survey of the entire Big Sandy River drainage in the 1960s and ‘70s. They found RTC and BHS at one site each in the Big Sandy River upstream of Big Sandy Reservoir. They also collected BHS at one site on Little Sandy Creek. Flannelmouth sucker were found to occur throughout the Big Sandy River and Little Sandy Creek below the National Forest boundary.

Bluehead sucker, FMS, and RTC face a number of potential threats to their continued survival in Wyoming, including habitat fragmentation (caused by dams and water development projects) and competition with and predation by introduced non-native fish species. Potential also exists for BHS and FMS to hybridize with introduced white sucker (WHS). Recent research has documented these phenomena in the Yampa River drainage of Colorado and Utah (Douglas and Douglas 2003). Baxter and Stone (1995) indicate that hybridization may also occur between RTC and introduced Utah chubs (UTC) and leatherside chubs (LSC). Because of these potential threats, additional information is needed to guide future management decisions for these species.

This project has been broken into two phases. Phase I was conducted in 2002 and entailed compiling existing information on BHS, FMS and RTC, assessing land ownership within the drainage, documenting potential barriers to fish passage, testing gear and sampling strategies, and conducting preliminary genetics sampling of FMS, BHS, WHS, and their hybrids. Additional information about Phase I can be found in Keith et al. (2003). Phase II of the project entails non-game fish sampling throughout the Green River drainage in Wyoming and will be completed over at least three field seasons. This report outlines progress on the first field season of Phase II, when sampling efforts were concentrated in the mainstem Green River and its east-side tributaries.

OBJECTIVES

The objective outlined for completion during Phase II, 2003, were to:

1. Determine the distribution and abundance of BHS, FMS, and RTC, hereafter target species,
2. Document the length frequency of each species at each sampling location to determine the distribution of different life stages of each species,
3. Document the native and non-native species composition, and
4. Attempt to determine the degree of hybridization that is occurring within the FMS and BHS and possibly RTC populations.

SITE DESCRIPTION

The Green River, the largest tributary to the Colorado River, and its tributaries drain an area of nearly 45,000 mi^2 in Wyoming, Colorado, and Utah. The Green River begins in the Wind River range of Wyoming and flows south to its confluence with the Colorado River in southeastern Utah. This project focuses on the portion of the Green River watershed located in southwestern Wyoming. This watershed drains an area of approximately 17,100 mi^2 in Wyoming and encompasses parts of Sublette, Fremont, Lincoln, Uinta, Sweetwater, and Carbon Counties (Figure 1).

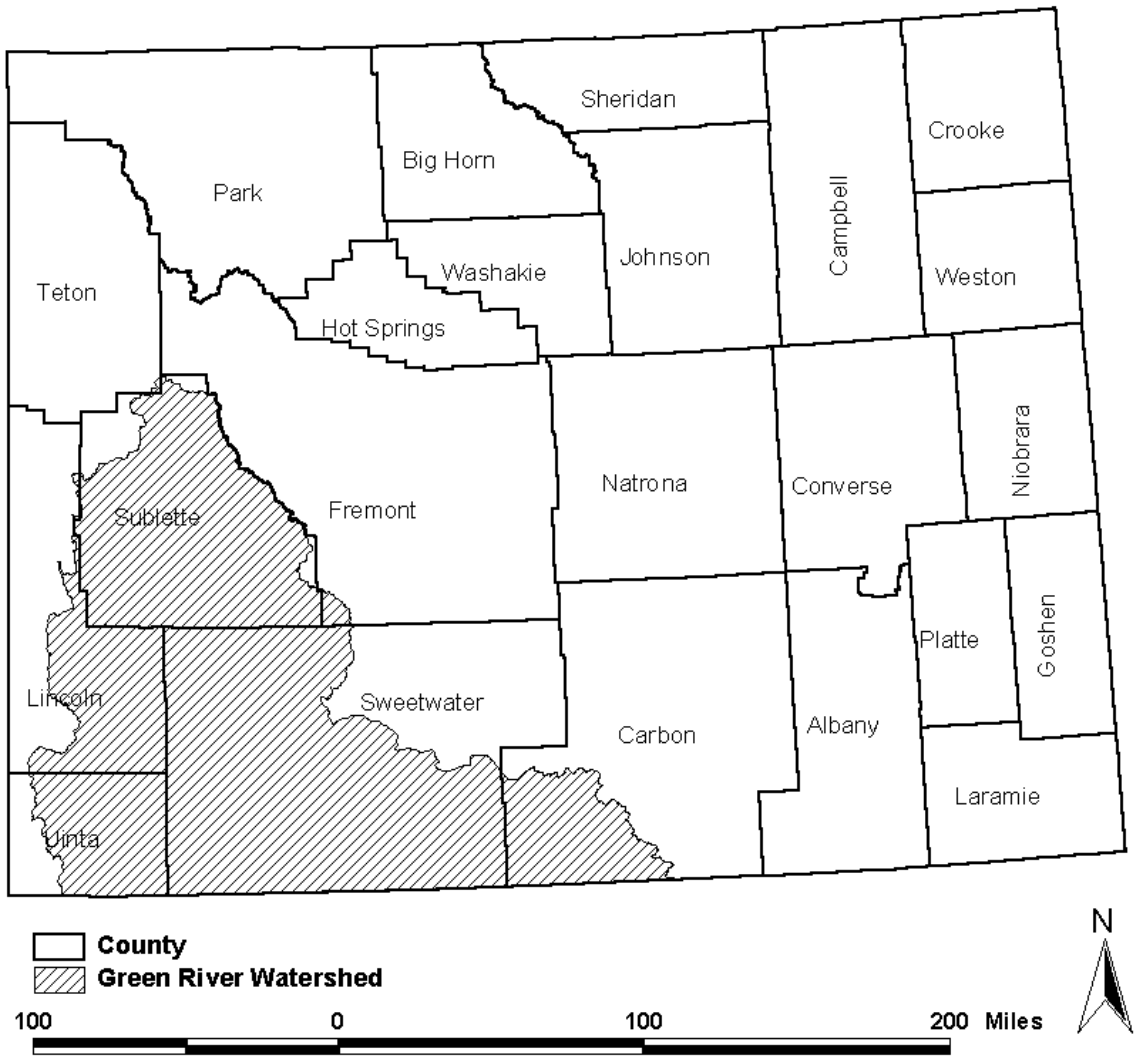

Figure 1.—Study area for native non-game fish surveys; the Green River watershed of southwest Wyoming.

Land ownership in the watershed is 72% public and 28% private. The Bureau of Land Management (BLM) manages the majority (75%) of the public land, followed by the U.S. Forest Service (USFS) the State of Wyoming (State), the Bureau of Reclamation (BOR), and the U.S. Fish and Wildlife Service (FWS) at 15.8, 5.5, 2.9, and 0.8% respectively.

Phase II efforts focused primarily on the eastern portion of the middle Green River watershed: the Green River between Fontenelle and Flaming Gorge Reservoirs, the Big Sandy River sub-drainage, the Bitter Creek sub-drainage, and the eastside tributaries to Flaming Gorge Reservoir (FGR) (Figure 2). In total, these sub-drainages encompass roughly 6,460 mi^2 or nearly 38% of the land area of the Green River watershed within Wyoming.

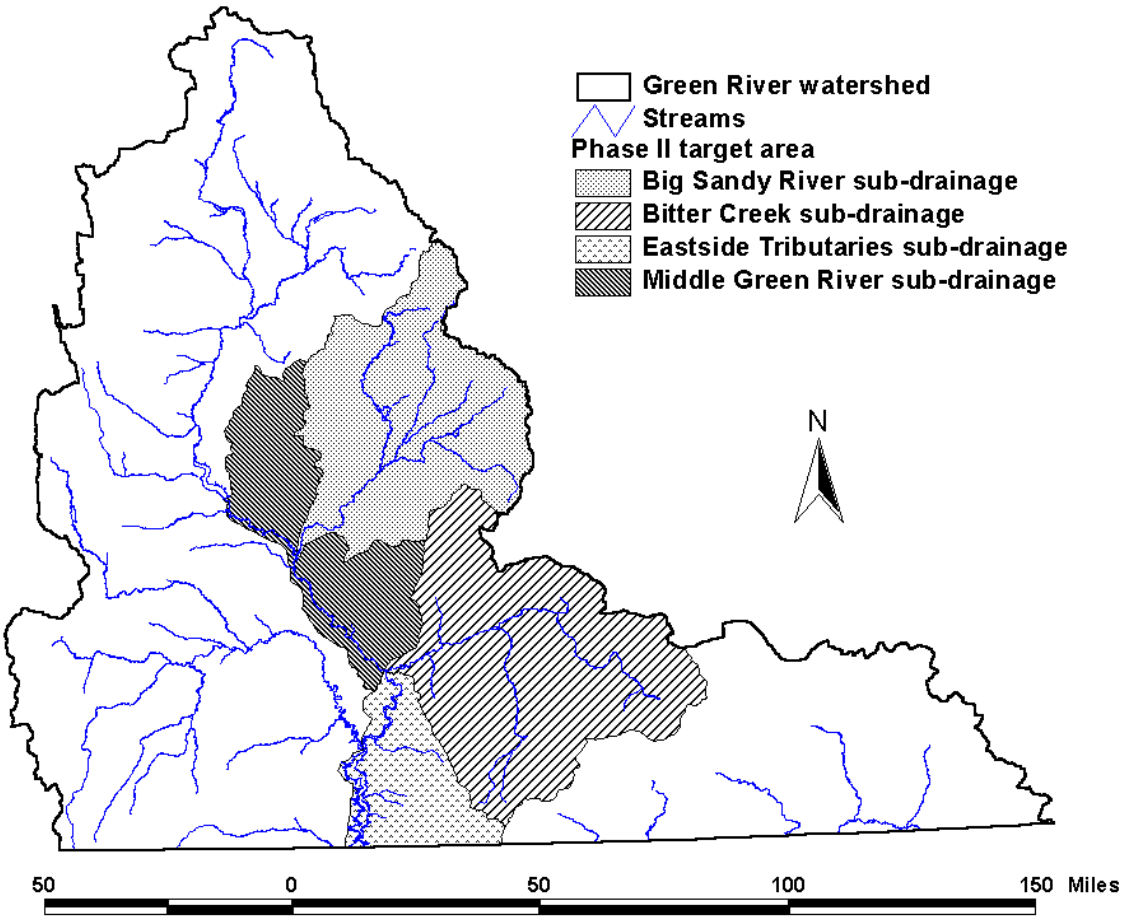

Figure 2.—Proposed target area for Phase II sampling during summer 2003: the Middle Green River, Big Sandy, Bitter Creek, and Eastside Tributaries to FGR sub-drainages.

Owing to recent drought conditions, a number of streams or stream reaches targeted for sampling in 2003 went dry during the summer. For this reason, three additional sub-drainages in the western portion of the middle Green River drainage were sampled. These included the Slate Creek, Fontenelle Creek, and Henrys Fork sub-drainages.

METHODS

Sampling reaches were systematically chosen throughout the study area. Reaches were spaced at 5-10-mi intervals on most streams, shorter intervals on smaller streams and longer intervals on larger streams. In some instances it was not possible to adhere to these criterion due to access problems.

Sampling reaches were a minimum of 656 ft long in perennial portions of streams. Occasionally, reaches were lengthened to end at a transition between habitat types. Prior to electrofishing, block nets were placed at the upstream and downstream boundaries of the sampling reach to prevent fish from moving in or out. At times, naturally barriers, such as beaver dams, were used as the upstream boundary of the sampling reach.

Reaches were sampled with shore-based, backpack, or raft electrofishing equipment, a bag seine or a combination of electrofishing equipment and a bag seine. The exception to this was a small impoundment on the headwaters of Jack Morrow Creek, which was sampled using gillnets.

Due to the high conductivities encountered in most streams, the majority of reaches were sampled with shore-based electrofishing equipment. When conditions allowed, backpack electrofishing equipment was used (e.g. Fontenelle Creek). On most occasions, a single electrofishing pass was completed over the entire sampling reach to assess the fish community. A single anode was used in smaller streams (< 15 ft wide); two anodes were used in larger stream reaches (> 15 ft wide). If electrofishing effectiveness was poor (owing to extremely high or low conductivity), an additional electrofishing pass or a seine haul may have been completed over all or a portion of the reach.

When residual pools were the only habitat type in a section of stream, a bag seine was used to sample the reach. Generally, a seine was hauled through the entire residual

pool. Depending on the number of fish collected on the first seine haul, additional seine hauls may have been completed.

All fish collected were sorted by species into plastic tubs and counted. Individual lengths and weights were recorded for all target species, hybrids, and WHS. When a large number of WHS were collected, lengths and weights were recorded for a minimum of 30 individuals and a count and batch weight was recorded for the remaining WHS. Counts, length ranges, and batch weights were recorded for all non-target species collected.

Tissue samples were collected from all BHS, FMS, and hybrids. The samples will be used to evaluate genetic purity and to verify phenotypic identification. A thumbnail-sized piece of left pelvic fin was clipped and preserved in a micro-centrifuge tube filled with 95% ethanol. In addition, a close-up picture was taken of the entire fish with a digital camera. If fish were too small to provide a sufficient sample from a fin, the fish was sacrificed and preserved in a micro-centrifuge tube. In reaches where large numbers of BHS, BXW, FMS, or FXW were sampled, a minimum of 20 tissue samples were collected per species.

RESULTS

A total of 60 reaches were sampled among the seven sub-drainages in 2003 (Figure 3). Twenty-three fish species were identified, of which only seven species were native to the Green River watershed: BHS, FMS, Colorado River cutthroat trout (CRC), mottled sculpin (MSC), mountain sucker (MTS), mountain whitefish (MWF), and speckled dace (SPD) (Appendix A). Of the target species, only BHS, FMS, and hybrids (FMS x WHS = FXW, BHS x WHS = BXW) were identified in sub-drainages that were intensively sampled during 2003. Bluehead sucker were noted in nine of the 60 reaches sampled (Figure 4), FMS were noted in 16 of the 60 reaches sampled (Figure 5). Hybridization between BHS and WHS was identified in three of the 60 reaches (Figure 4); hybridization between FMS and WHS was identified in 11 of the 60 reaches (Figure 5). No RTC were identified in the seven sub-drainages sampled.

Tissue samples and matching photos were collected from 257 native suckers and hybrids (167 FMS, 59 BHS, 21 FXW, and 10 BXW; Appendix B). The tissue samples are being stored at the Laramie Regional Office awaiting analysis.

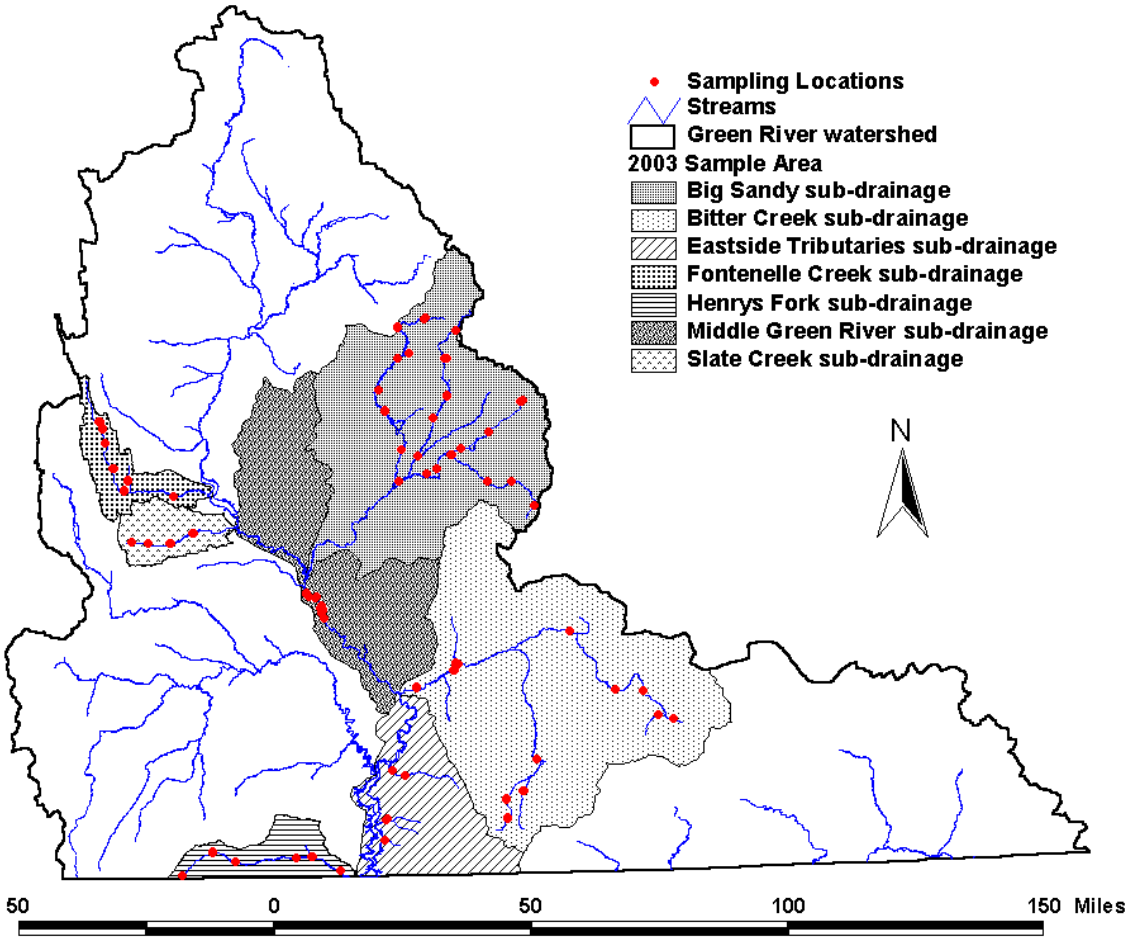

Figure 3.—Locations of sub-drainages and reaches sampled in summer 2003.

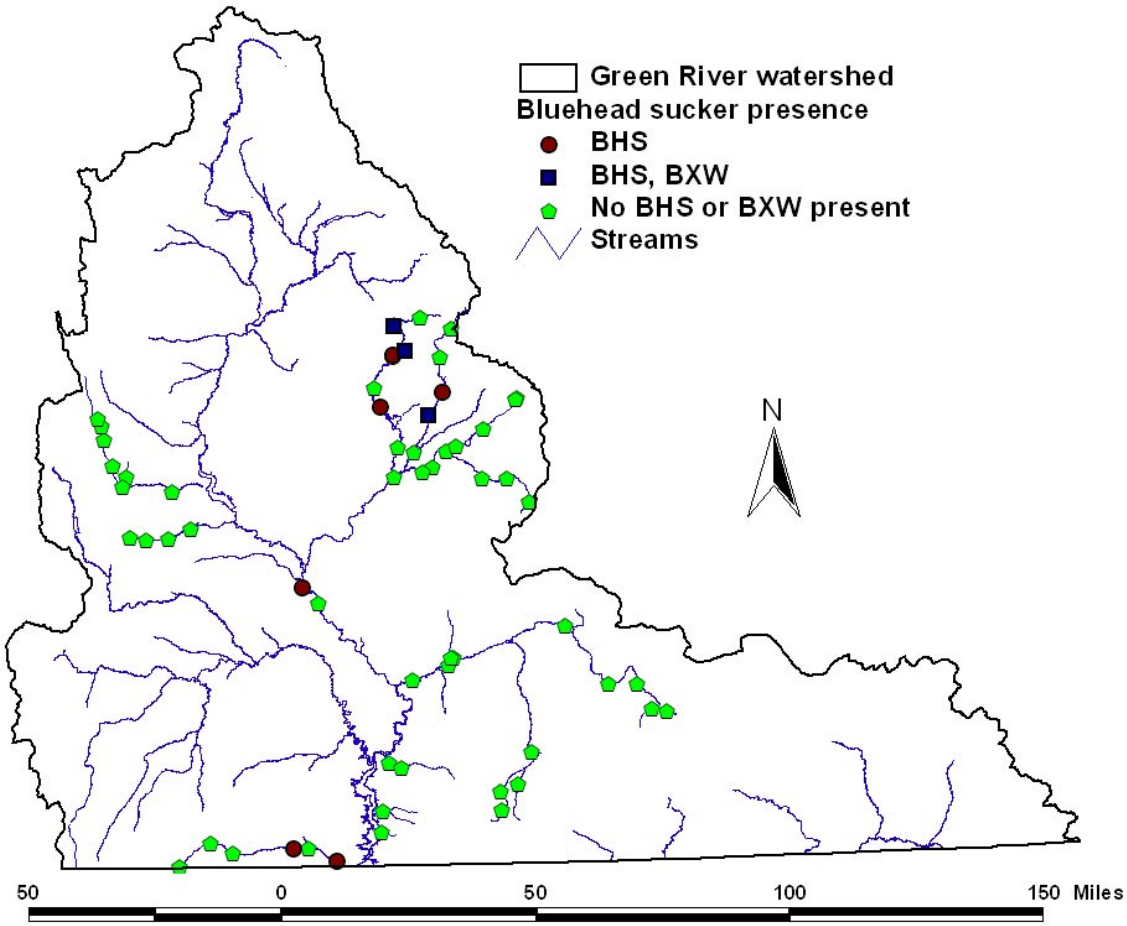

Figure 4.—Locations of reaches where BHS or hybrids were identified during summer 2003 sampling.

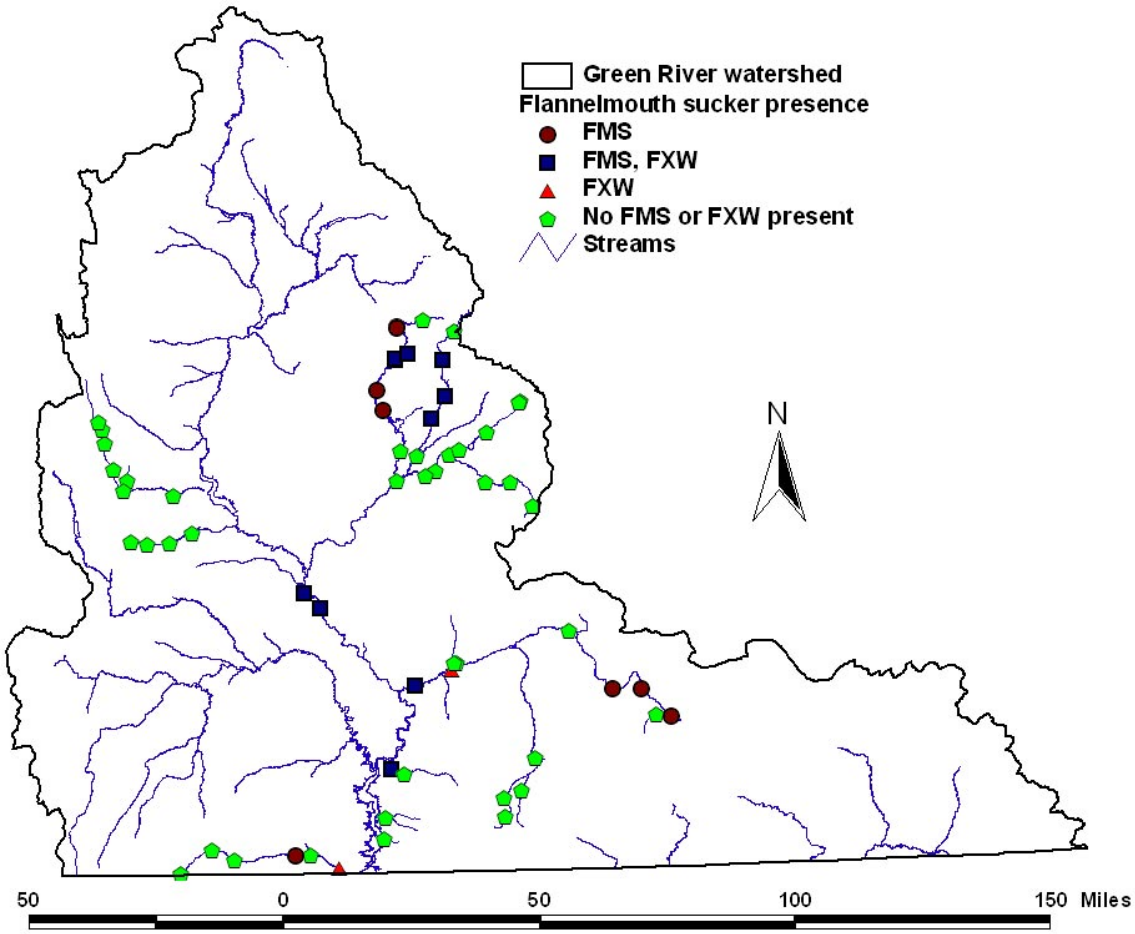

Figure 5.—Locations of reaches where FMS or hybrids were identified during summer 2003 sampling.

Big Sandy River sub-drainage

The Big Sandy River sub-drainage drains an approximately 1,810-mi^2 area in the eastern portion of the Green River watershed (Figure 2). Two vegetative cover types, Wyoming big sagebrush and mixed-grass prairie comprised nearly three-quarters of the land area of the Big Sandy River sub-drainage. Land ownership in the sub-drainage is 95% public and 5% private. The BLM manages most (82.4%) of the public land, followed by the BOR (6.6%), the USFS (5.8%), and the State (5.2%).

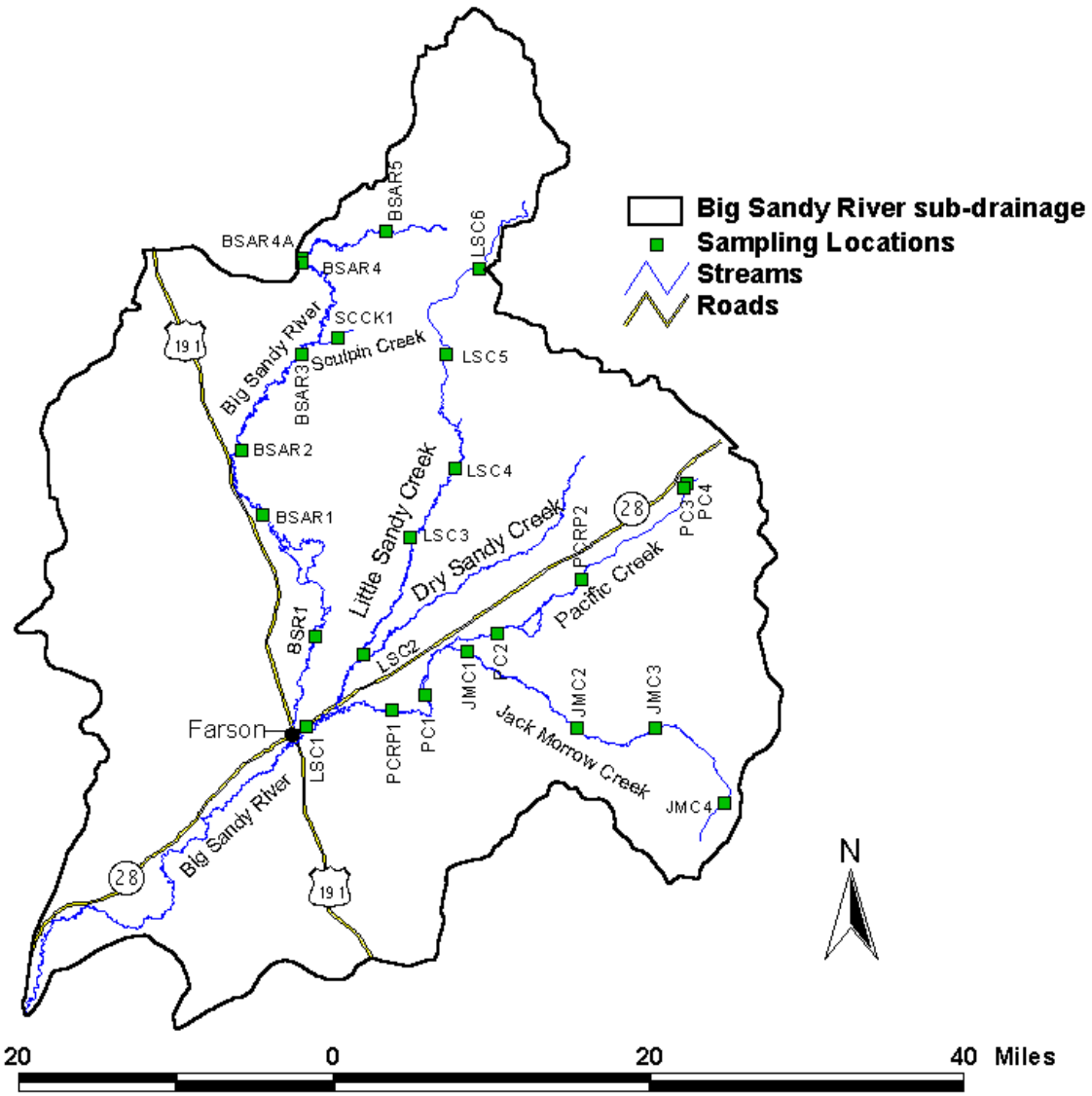

Figure 6.—Locations of reaches sampled in the Big Sandy River sub-drainage in 2003.

In total, 24 reaches were sampled among five streams in the sub-drainage in 2003 (Figure 6 and Appendix C). Fifteen fish species, including six native species, were identified among the 24 reaches sampled throughout the Big Sandy River sub-drainage in 2003 (Appendix D). Only two target species, BHS and FMS, were identified in the sub-drainage. Both species were found in the Big Sandy River, Little Sandy Creek, and Sculpin Creek.

Big Sandy River

The Big Sandy River empties into the Green River between FGR and Fontenelle Reservoir. Seven reaches were sampled on the Big Sandy River during 2003 (Figure 6 and Appendix C). One reach was located downstream of Big Sandy Reservoir (BSR) and the six remaining reaches were upstream of BSR. The portion of the Big Sandy River from Farson, WY to the Green River has been comprehensively sampled in recent years to monitor the game fish community and to note the native non-game fish composition (WGFD 1999, WGFD 2000). Therefore, this portion of the Big Sandy River was not sampled in 2003.

Downstream of BSR the stream was approximately 14 ft. wide (mean width) and generally shallow (max depth < 1.5 ft). Upstream of the reservoir the stream was typically wider (mean width 32.4 ft based on measures recorded at the six reaches) and deeper (max depth > 3 ft).

A total of 14 fish species, including six native species (BHS, FMS, MSC, MWF, MTS, and SPD) were observed among the seven reaches sampled on the Big Sandy River (Appendix D). No target species were identified downstream of BSR. Upstream of BSR, FMS were documented in five of the six reaches and BHS were documented in three of the six reaches (Figure 6). Between BSR and BSAR3, FMS comprised the majority of the sucker assemblage, upstream of BSAR3 WHS dominated (Figure 6). Although BHS were identified among three of the six reaches sampled upstream of BSR they comprised a small portion of the sucker assemblage (Figure 7). No FMS, FXW, BHS, BXW, or WHS were collected in BSAR5 (Figure 7), the upstream most site sampled on the Big Sandy River.

Obvious hybridization was noted between BHS and WHS and between FMS and WHS upstream of BSR (Appendix D). Nevertheless, the apparent hybridization rate seemed low (Figure 7); one BXW and one FXW were identified among the 14 BHS and 322 FMS collected upstream of BSR. Due to the small size of juveniles, it is possible that more hybrids may have been present but were misidentified. Genetic analysis of tissue samples collected should help verify identifications.

Flannelmouth sucker dominated the catch in the first three reaches upstream of BSR (Appendix D and Figure 7). The FMS population was composed entirely of juveniles in BSAR1 (Appendix D). In BSAR2 and BSAR3, the FMS population was

composed of juveniles and large adults. The length of FMS in BSAR2 ranged from 1.4 to 20.2 in, but no FMS were observed between three and 15.9 in (Figure 8). In BSAR3, FMS ranged in length from 1.2 to 20.5 in, but no FMS were observed between three and 16.9 in (Figure 9). These data suggest the potential failure of one or more year classes of FMS. It is possible that these reaches did not contain habitat suitable for the missing year classes or that these year classes were not susceptible to the gear used.

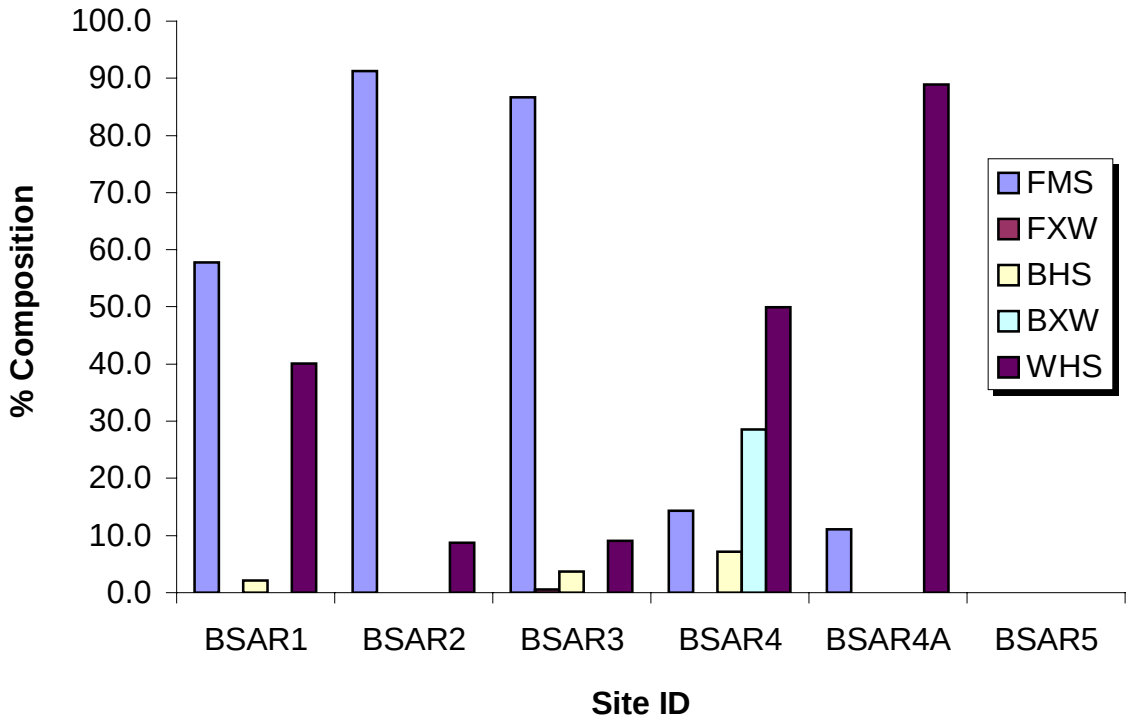

Figure 7.— Relative abundance of FMS, FXW, BHS, BXW, and WHS collected among reaches upstream of Big Sandy Reservoir in August 2003.

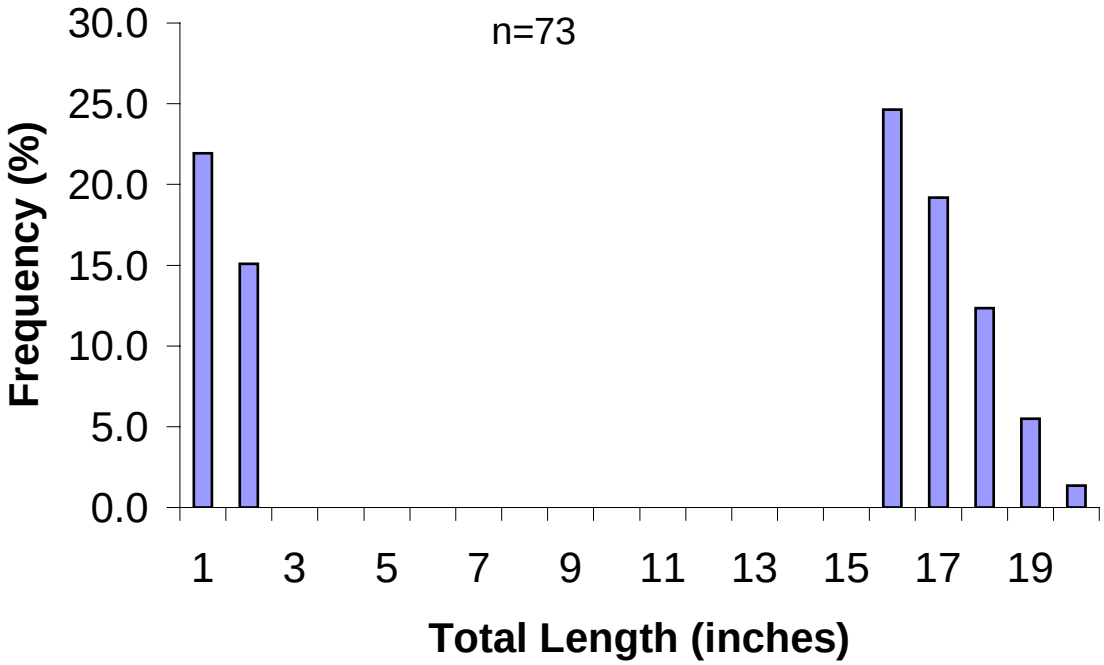

Figure 8.—Length-frequency histogram of FMS collected from the BSAR2 reach of the Big Sandy River.

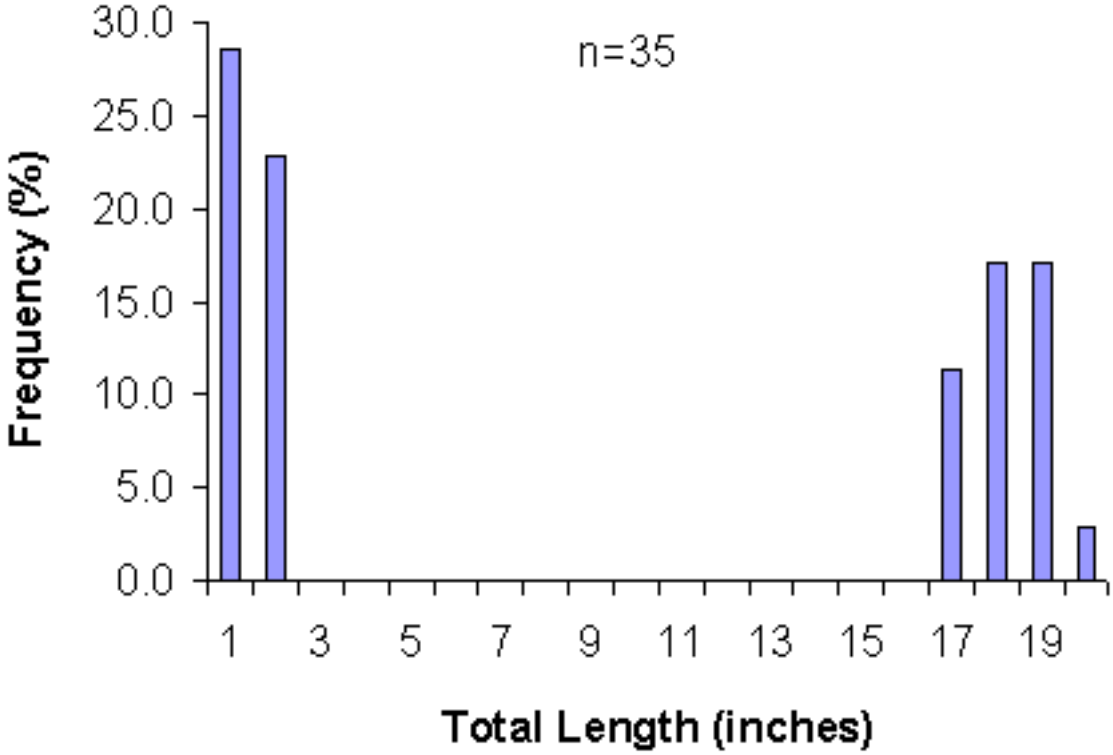

Figure 9.—Length-frequency histogram of FMS collected from the BSAR3 reach of the Big Sandy River.

Sculpin Creek

Sculpin Creek is a small tributary to the east side of the Big Sandy River between BSAR3 and BSAR4 (Figure 6). One reach was sampled on Sculpin Creek during August 2003). At the time of sampling Sculpin Creek was narrow (mean width = 3.3 ft) but contained several deep pools (>1.5 ft).

Nine fish species, including six native species (BHS, FMS, MSC, MTS, MWF and SPD), were identified in Sculpin Creek during 2003 (Appendix D). Eight BHS and four FMS were collected within the reach. In addition, three BXW and one FXW were also noted. Although both BHS and FMS were present in the reach, the sucker assemblage was dominated by WHS (Appendix D and Figure 10). Bluehead sucker and BXW collected in the reach were all less than six inches long; FMS were all less than five inches (Figure 10). The fact that juvenile individuals dominated the sucker assemblage suggests that the stream may be an important spawning tributary for adult suckers in the Big Sandy River.

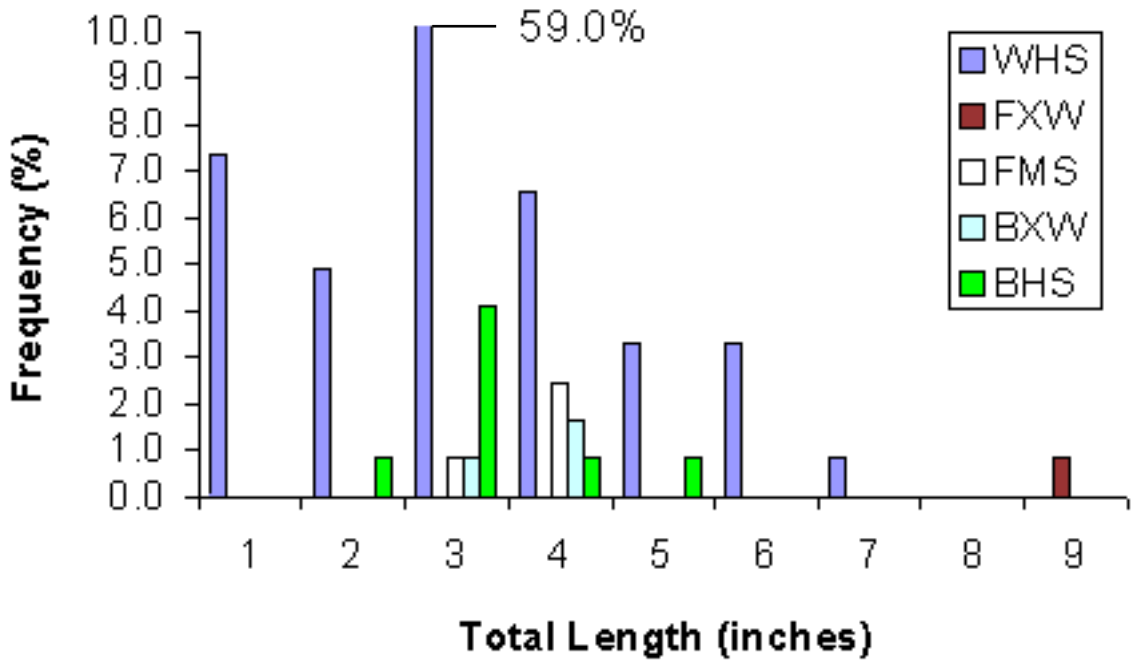

Figure 10.— Length-Frequency histogram for BHS, BXW, FMS, FXW, and WHS collected from Sculpin Creek in reach SCCK1.

Little Sandy Creek

Little Sandy Creek is a tributary to the Big Sandy River southwest of Farson, WY. Six reaches were sampled on Little Sandy Creek (Figure 6 and Appendix C). Two reaches were located downstream of a diversion that conveys water to Eden Reservoir. The four remaining reaches were located upstream of the diversion. The diversion appears to be a definite barrier to upstream fish migration.

Downstream of the diversion the stream contained substantially less flow. The stream averaged 14 ft wide and maximum depth was less than two ft. Upstream of the diversion the stream contained more flow. The stream averaged 18.5 ft wide and maximum depth was greater than 2.5 ft at all reaches, with an overall maximum depth of almost five ft. During summer, most Little Sandy Creek flow was diverted to Eden Reservoir.

Twelve fish species, including five native species (BHS, FMS, MSC, MTS, and SPD) were collected from the six Little Sandy Creek reaches (Appendix D). No target species were identified downstream of the diversion, but BHS and FMS were collected upstream of the diversion. BHS were documented in two of the four reaches and FMS were documented in three of the four reaches. While both BHS and FMS were present upstream of the diversion, WHS dominated the sucker assemblage in all reaches (Figure 11). No sucker species were collected in LSC6 (Figure 11).

Bluehead sucker were collected in LSC3 and LSC4. Flannelmouth sucker were collected in LSC3 (n=11), LSC4 (n=7), and LSC5 (n=1). The length of BHS ranged from 2.0 to 10.9 inches at LSC3 and from 2.6 to 8.5 inches at LSC4 (Figure 12). The length of FMS ranged from 6.5 to 15.6 inches at LSC3 and from 3.1 to 8.4 inches at LSC4 (Figure 13). Interestingly, no Big Sandy River FMS were between three and 15.9 inches TL (Figure 8 and 9), but all Little Sandy Creek FMS were between three and 15.9 inches (Figure 13).

Hybridization was noted between BHS and WHS and between FMS and WHS upstream of the diversion. However, the hybridization rate seems low between BHS and WHS (Figure 11); two BXW were identified upstream of the diversion. Hybridization was more prevalent between FMS and WHS (Figure 11); 12 FXW were collected upstream of the diversion.

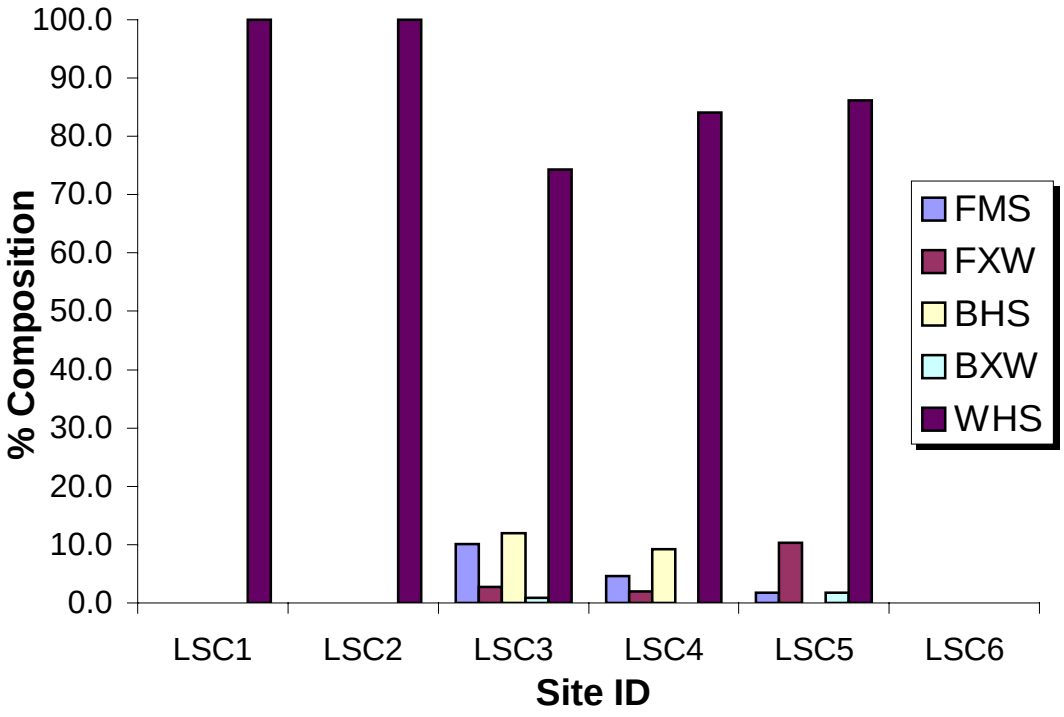

Figure 11.— Relative abundance of FMS, FXW, BHS, BXW, and WHS in Little Sandy Creek sampling reaches.

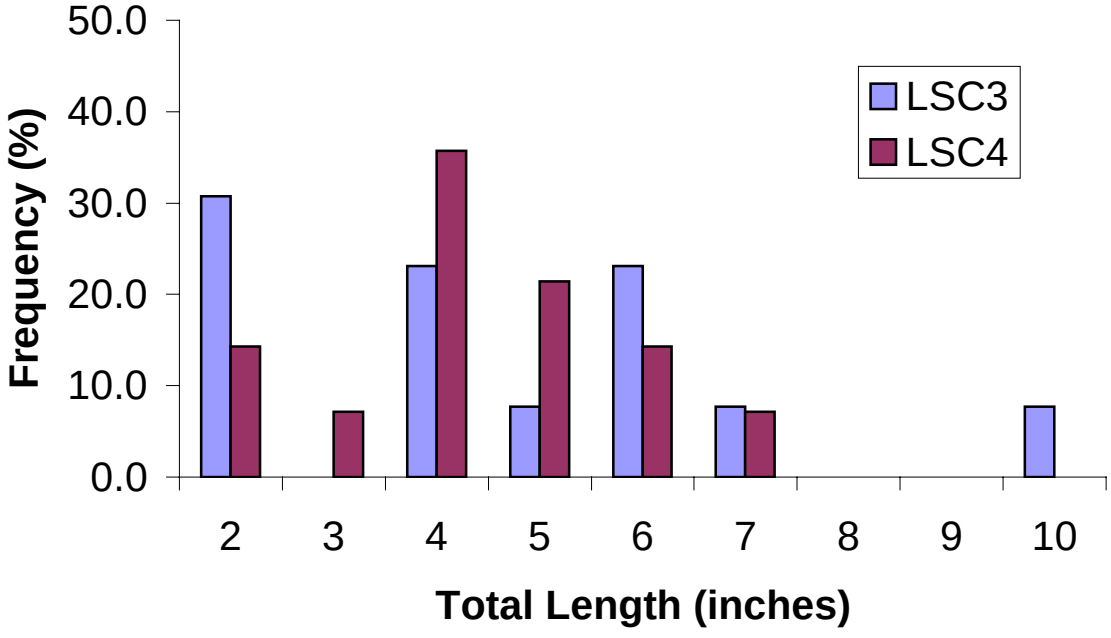

Figure 12.— Length-Frequency histogram for BHS collected from Little Sandy Creek in reaches LSC3 and LSC4. (For LSC3, n=13; for LSC4, n=14).

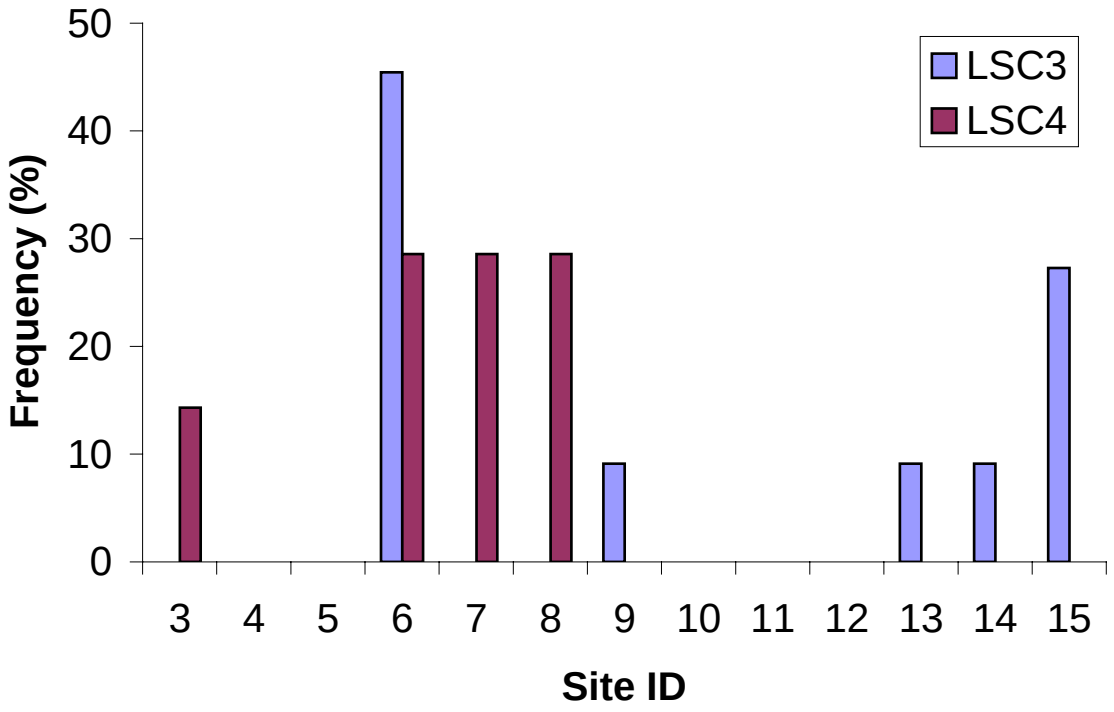

Figure 13.—Length-Frequency histogram for FMS collected from Little Sandy Creek in reaches LSC3 and LSC4.

Pacific Creek

Pacific Creek is a tributary to Little Sandy Creek near Farson, WY. A total of six reaches were sampled on Pacific Creek (Figure 6 and Appendix C). Four reaches were sampled in stream portions containing perennial flow; the other two reaches were in residual pools.

Eight fish species were documented among the six reaches sampled on Pacific Creek (Appendix D). Two native species, MTS and SPD, were noted among the eight species. No target species were documented in Pacific Creek.

Dry Sandy Creek

Dry Sandy Creek is a tributary to Little Sandy Creek northeast of Farson, WY (Figure 6). No reaches were sampled on Dry Sandy Creek. This stream was dry for its entire length during summer 2003.

Jack Morrow Creek

Jack Morrow Creek is a tributary to Pacific Creek between Eden Canal and County Road 21. Four reaches were sampled on Jack Morrow Creek (Figure 6 and Appendix C). Due to a lack of perennial water, Jack Morrow Creek was typified by long dry portions intermixed with residual pools. All reaches on Jack Morrow Creek were in residual pools, with the exception of JMC4, which was in a small impoundment (Appendix C).

Four fish species, including one native species (MTS), were collected in JMC3 (Appendix D). No fish were collected in the other three reaches (Appendix D).

Bitter Creek sub-drainage

The Bitter Creek sub-drainage drains an area of approximately 2,230 mi^2 in the eastern portion of the Green River watershed (Figure 2). Three vegetative cover types, Wyoming big sagebrush, mixed grass, and desert shrub dominate the land area of the Bitter Creek sub-drainage. Land ownership in the sub-drainage is 56% public and 44% private. The BLM manages most (94.7%) of the public land, with the remaining public land in the sub-drainage owned by the State (5.3%). Owing to drought, the entire length of Little Bitter Creek was dry during summer 2003.

In total, 13 reaches were sampled among five streams in the Bitter Creek sub-drainage in 2003 (Figure 14 and Appendix C). Fifteen fish species, including six native species, were identified in the sub-drainage in 2003 (Appendix E). Flannelmouth sucker was the only target species identified and distribution was limited to mainstem Bitter Creek.

Bitter Creek

Bitter Creek is a tributary to the Green River near the town of Green River, WY. Seven reaches were sampled on Bitter Creek. Three of the reaches were located between Green River, WY and the east side of Rock Springs, WY. The remaining four reaches were located between Point of Rocks, WY and Fort. La Clede, WY. During summer 2003 the stream channel was dry from the east side of Rock Springs to a point just west of Point of Rocks (Figure 14). Between Point of Rocks and Bitter Creek, WY access to the stream was limited by railroad tracks and an active strip mine.

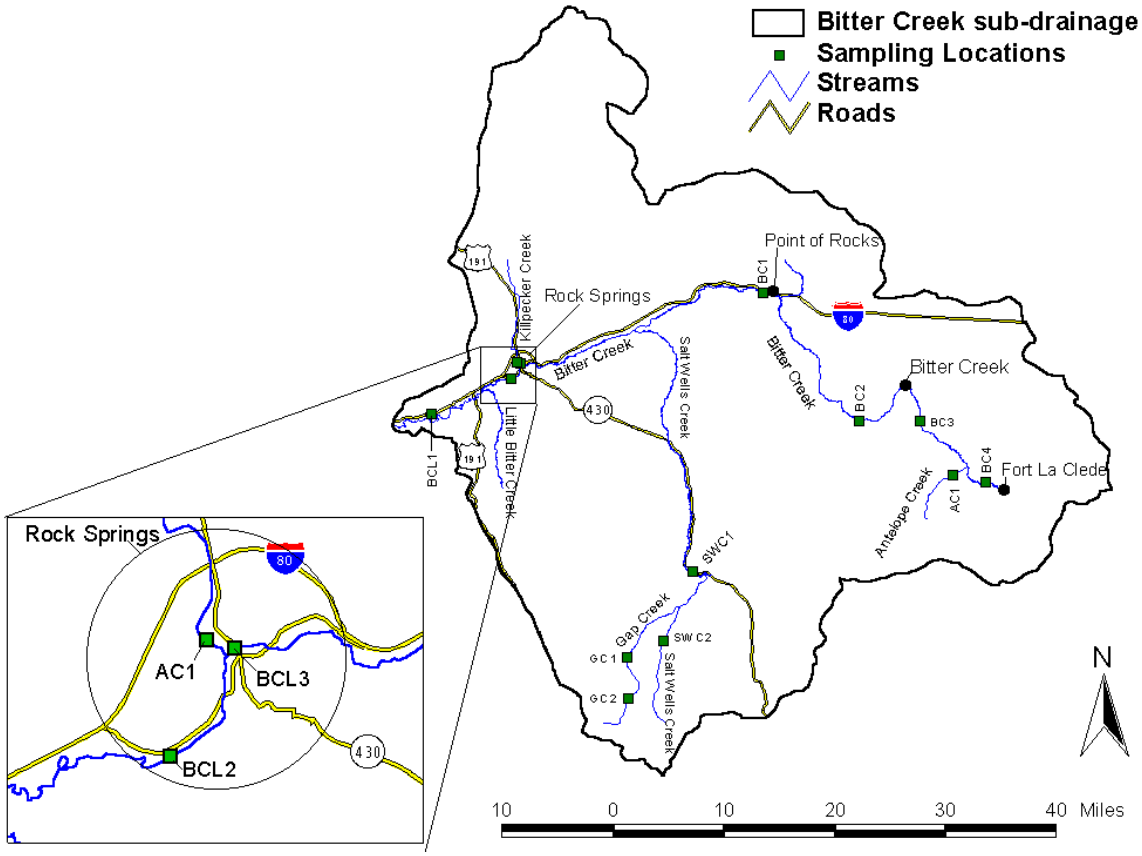

Figure 14.— Locations of reaches sampled in the Bitter Creek sub-drainage during 2003.

A total of eight fish species, including three native species (FMS, MTS, and SPD) were observed among the seven reaches sampled on Bitter Creek (Appendix E). Non-native species dominated the fish community between the Green River and the east side of Rock Springs, but two FMS and four FXW were also identified in this stretch (Appendix E).

Between Point of Rocks and Fort La Clede, three native species (MTS, SPD, and FMS) were all that were collected (Appendix E). Flannelmouth sucker were documented in three of the four reaches sampled (but only one individual in BC4). Twenty-four FMS were collected in BC2. They ranged from 2.8 to 13.5 in TL, although the majority were < 6 in (Figure 15). Forty-five FMS were collected in BC3. The length of FMS in BC3 ranged from 2.8 to 15.1 in, with the majority of FMS being < 6 in (Figure 16).

The fact that only native species were collected upstream of Rock Springs may be telling. The ephemeral nature of the section of stream between Rock Springs and Point

of Rocks may be preventing the movement of introduced species into this portion of stream.

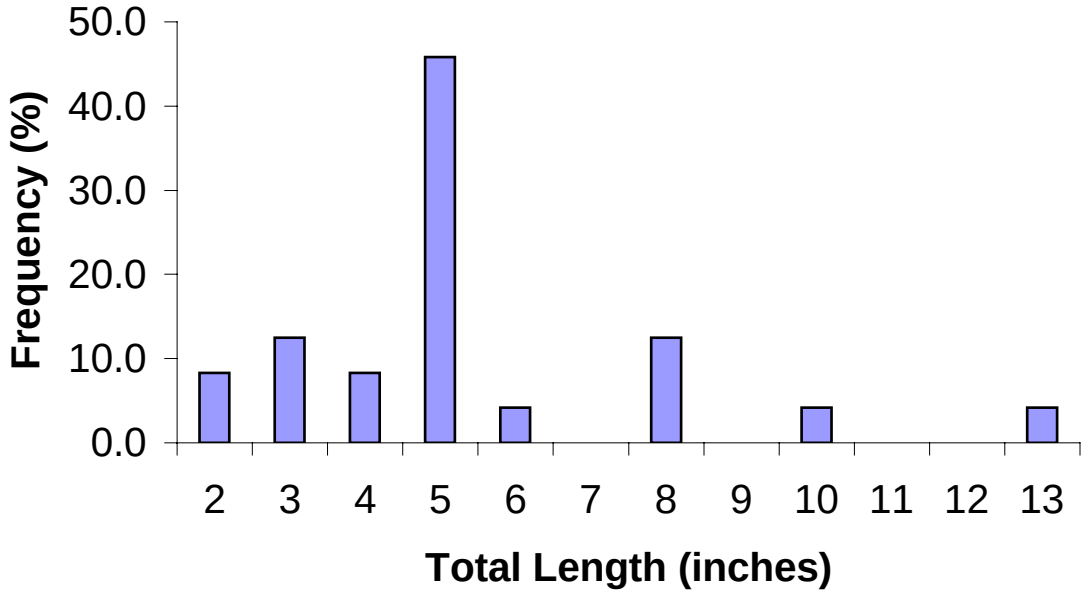

Figure 15.—Length-Frequency histogram for FMS collected from Bitter Creek reach BC2.

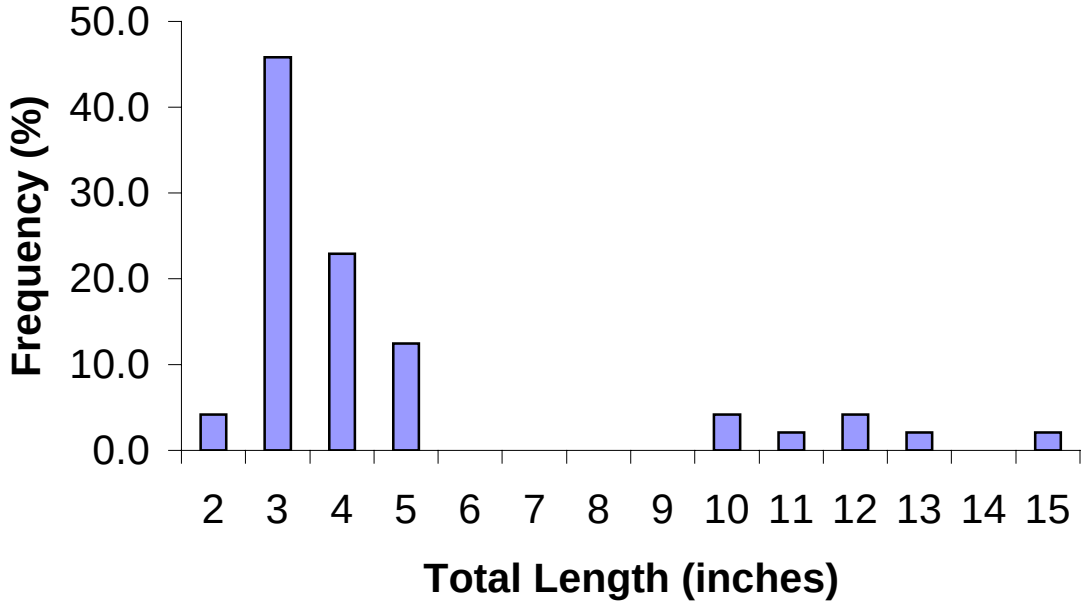

Figure 16.—Length-Frequency histogram for FMS collected from Bitter Creek reach BC3.

Killpecker Creek

Killpecker Creek empties into Bitter Creek in the center of Rock Springs (Figure 14). Killpecker creek was dry for most of its length during summer 2003; it contained perennial flow from the north end of Rocks Springs to its confluence with Bitter Creek.

One reach was sampled on Killpecker Creek (Figure 14 and Appendix C). No fish were collected (Appendix E).

Salt Wells Creek

Salt Wells Creek is a tributary to Bitter Creek between Rock Springs and Point of Rocks (Figure 14). During summer 2003 much of Salt Wells Creek was dry. A few residual pools remained near the headwaters. Two residual pools were sampled on Salt Wells Creek (Figure 14 and Appendix C).

Four species, including two native species (MTS and SPD), were collected from the two reaches (Appendix E). The fish community in both reaches was dominated by FHM. Although two native species (MTS and SPD) were present in SWC1, they were relatively scarce compared to introduced species (Appendix E).

Gap Creek

Gap Creek is a tributary to Salt Wells Creek. In summer 2003, Gap Creek was characterized by a short section with perennial flow and large dry sections (with a few residual pools). Two reaches were sampled on Gap Creek (Figure 14 and Appendix C), one in a portion of stream with perennial flow and one in portion containing two residual pools.

Three fish species were collected in GC1, two native species (MTS and SPD) and one introduced species (FHM, Appendix E). No fish were collected in GC2 (Appendix E).

Antelope Creek

Antelope Creek is a small tributary to Bitter Creek near Fort La Clede, WY. One reach was sampled on Antelope Creek (Figure 14 and Appendix E)

Two native species (MTS and SPD) were the only fish captured in the reach (Appendix E).

Eastside Tributaries sub-drainage

The Eastside Tributaries sub-drainage drains approximately 670 mi^2 in the eastern portion of the Green River watershed (Figure 2). Wyoming big sagebrush and juniper woodland are the primary vegetative cover types in this sub-drainage. Land ownership in the sub-drainage is 81% public and 19% private. The majority of public land is managed by the BLM (73.1%) followed by the USFS (18.4%) and State (8.5%).

Upper Sage Creek, Trout Creek, and Currant Creek have been sampled extensively over the past few years to monitor the CRC populations in these streams (WGFD 1998, WGFD 2001). The surveys also provided ample data regarding the native non-game fish community in these streams. No target species were documented during these surveys. Consequently, these streams were not sampled in 2003. In total, four reaches were sampled among three streams in the Eastside Tributaries sub-drainage (Figure 17 and Appendix C).

Sage Creek

Sage Creek is a tributary to the Green River Arm of FGR. Two reaches were sampled on Sage Creek in 2003 (Figure 17).

Six fish species, including two native species (FMS and MTS), were collected from the two reaches (Appendix F). FMS was the only target species noted. Two FMS and a single FXW were identified in SACK1. Mountain sucker was the only species collected in SACK2 (Appendix F).

Upper Marsh Creek

Upper Marsh Creek empties into the eastside of FGR. One reach was sampled on Upper Marsh Creek in 2003 (Figure 17 and Appendix C).

No fish were collected in the electrofishing reach or in the pool below the culvert (Appendix F). The culvert is likely a barrier to upstream fish migration.

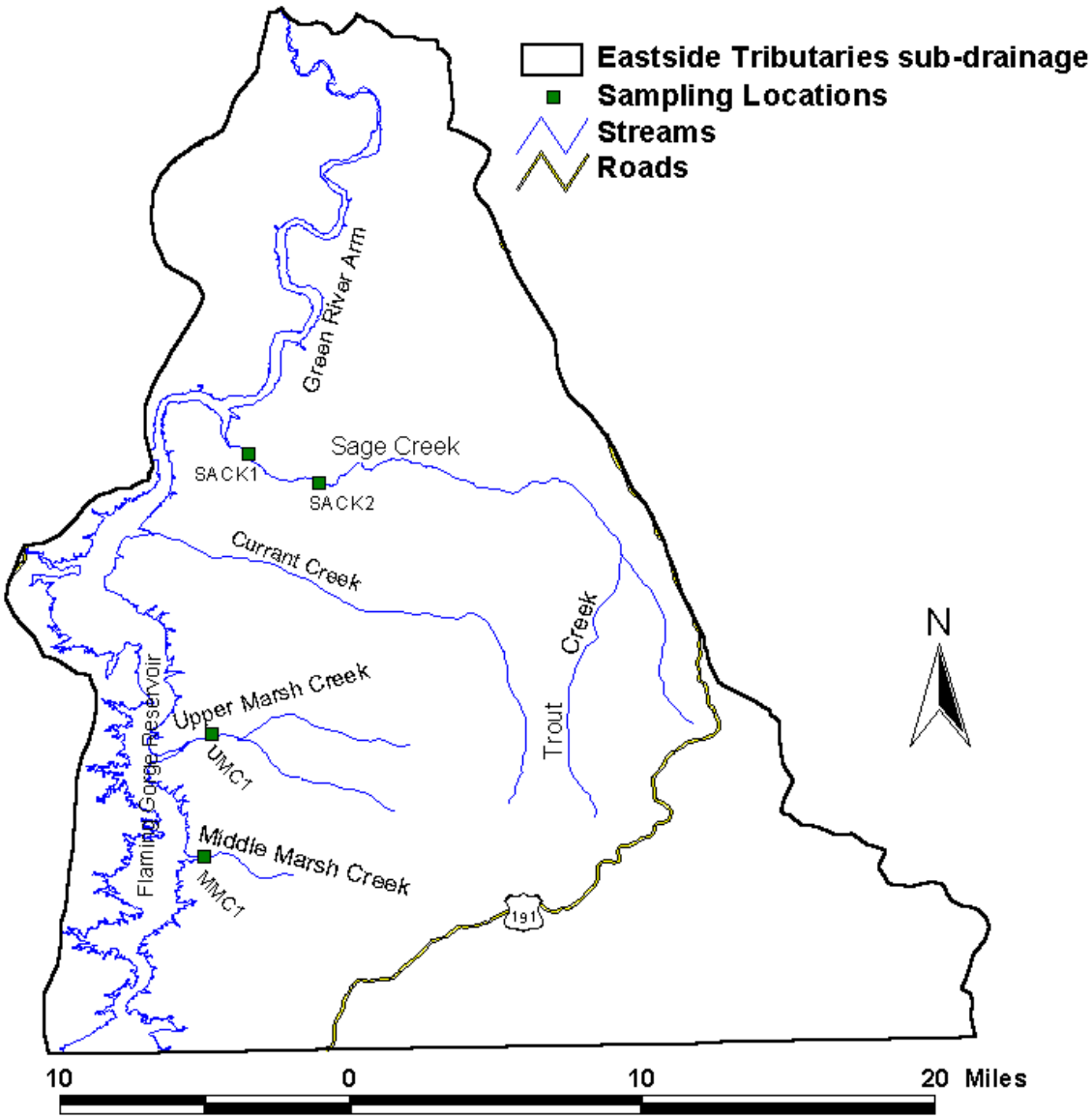

Figure 17.—Location of reaches sampled in the Eastside Tributaries sub-drainage during 2003.

Middle Marsh Creek

Middle Marsh Creek is a tributary to the eastside of FGR. One reach was sampled on Middle Marsh Creek in 2003 (Figure 17 and Appendix C).

No fish were collected in the electrofishing reach upstream of the culvert. Six WHS and two rainbow trout (RBT) were collected in the pool below the culvert (Appendix F). The culvert is a definite barrier to upstream fish migration.

Fontenelle Creek sub-drainage

The Fontenelle Creek sub-drainage drains an area of approximately 230 mi^2 in the western portion of the Green River watershed (Figure 2). Aspen, spruce-fir, and lodgepole pine typify the vegetative community in the headwaters of Fontenelle Creek. Wyoming big sagebrush and mixed grass prairie dominate lower in the sub-drainage. Land ownership in the sub-drainage is composed of 83% public and 17% private. The BLM manages most (64.3%) of the public land. The remaining public land in the sub-drainage is owned by the USFS (30%), the State (4.8%), and the BOR (0.9%).

In total, seven reaches were sampled from two streams in the Fontenelle Creek sub-drainage (Figure 18 and Appendix C). No target species were collected in any of the reaches.

Fontenelle Creek

Fontenelle Creek is a tributary to Fontenelle Reservoir. It empties into the west side of the reservoir just north of County Road 314. In total, six reaches were sampled on Fontenelle Creek in 2003 (Figure 18 and Appendix C).

Twelve fish species, four of which are native to the drainage (MSC, MTS, MWF, and SPD), were collected among the six reaches sampled on Fontenelle Creek, (Appendix G). Introduced species dominated the species composition lower in the drainage; native species were more prevalent in the upper portion of the drainage (Appendix G).

Dutch George Creek

Dutch George Creek is a tributary to Fontenelle Creek. The stream flows in a north to south direction and empties into Fontenelle Creek between FC1 and FC2 (Figure 18). One reach was sampled on Dutch George Creek (Appendix C). No fish were collected (Appendix G).

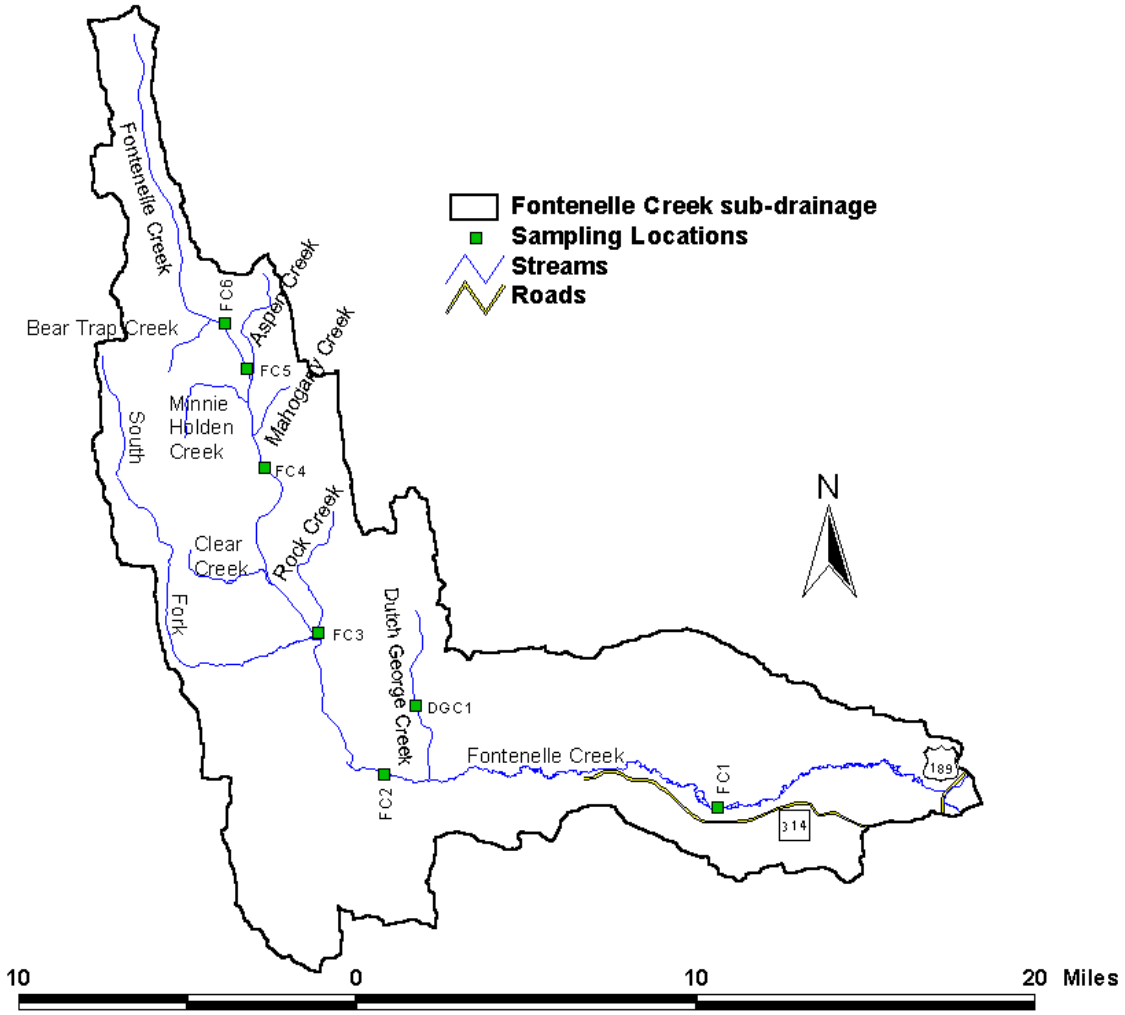

Figure 18.—Location of reaches sampled in the Fontenelle Creek sub-drainage during 2003.

Henrys Fork sub-drainage

The Wyoming portion of the Henrys Fork sub-drainage drains an area of approximately 256 mi^2 in the western portion of the Green River watershed (Figure 2). Wyoming big sagebrush and desert shrub dominate the vegetative cover of the Wyoming portion of the sub-drainage. Land ownership in the sub-drainage is 75% public and 25% private. BLM manages most (92.1%) of the public land. The remaining public land in the sub-drainage is owned by the State (4.3%) and the USFS (3.7%).

The mainstem of the Henrys Fork was sampled in summer 2003. The tributary streams will be sampled in 2004.

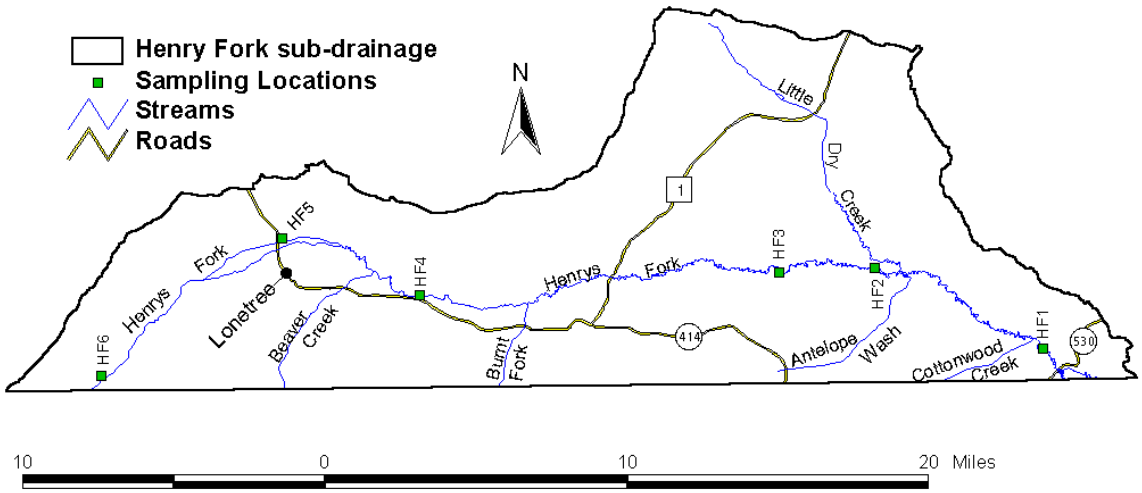

Figure 19.—Locations of reaches sampled in the Wyoming portion of the Henrys Fork sub-drainage in 2003.

Henrys Fork

The Henrys Fork empties into the west side of FGR just north of Manila, UT. In total, six reaches were sampled on the Henrys Fork between FGR and the Utah border in 2003 (Figure 19 and Appendix C). A large gap exists between sampling reaches HF3 and HF4 (Figure 19). It was not possible to gain access to this portion of stream during 2003 due to private land issues.

Nine fish species, including six native species (BHS, CRC, FMS, MSC, MTS, and SPD), were collected among the six reaches sampled during 2003 (Appendix H). Bluehead sucker and FMS were noted among the six reaches. Bluehead sucker were identified in two of the six reaches (Figure 4), FMS were identified in one of the six reaches (Figure 5 and Appendix H). Nine BHS (4.4 – 7.0 in) were identified in HF1. Ten FMS (5.4 – 20.8 in) and one BHS (5.9 in) were identified in HF3. In addition, three FXW (6.4 – 7.4 in) were noted in HF1 (Appendix H).

Middle Green River sub-drainage

The middle Green River sub-drainage (Figure 2) drains an area of approximately 1,060 mi^2. Wyoming big sagebrush, mixed grass prairie, and desert shrub comprise the majority of the vegetative cover in the sub-drainage. Land ownership in the sub-drainage is 75% public and 25% private. The BLM manages most (76.2%) of the public land.

The BOR (20.1%), the FWS (2.7%), and the State (1.0%) own the remaining public land in the sub-drainage.

Two reaches were sampled in the middle Green River sub-drainage (Figure 20). Both reaches were on the main stem of the Green River between Fontenelle Reservoir and Green River, WY (Appendix C).

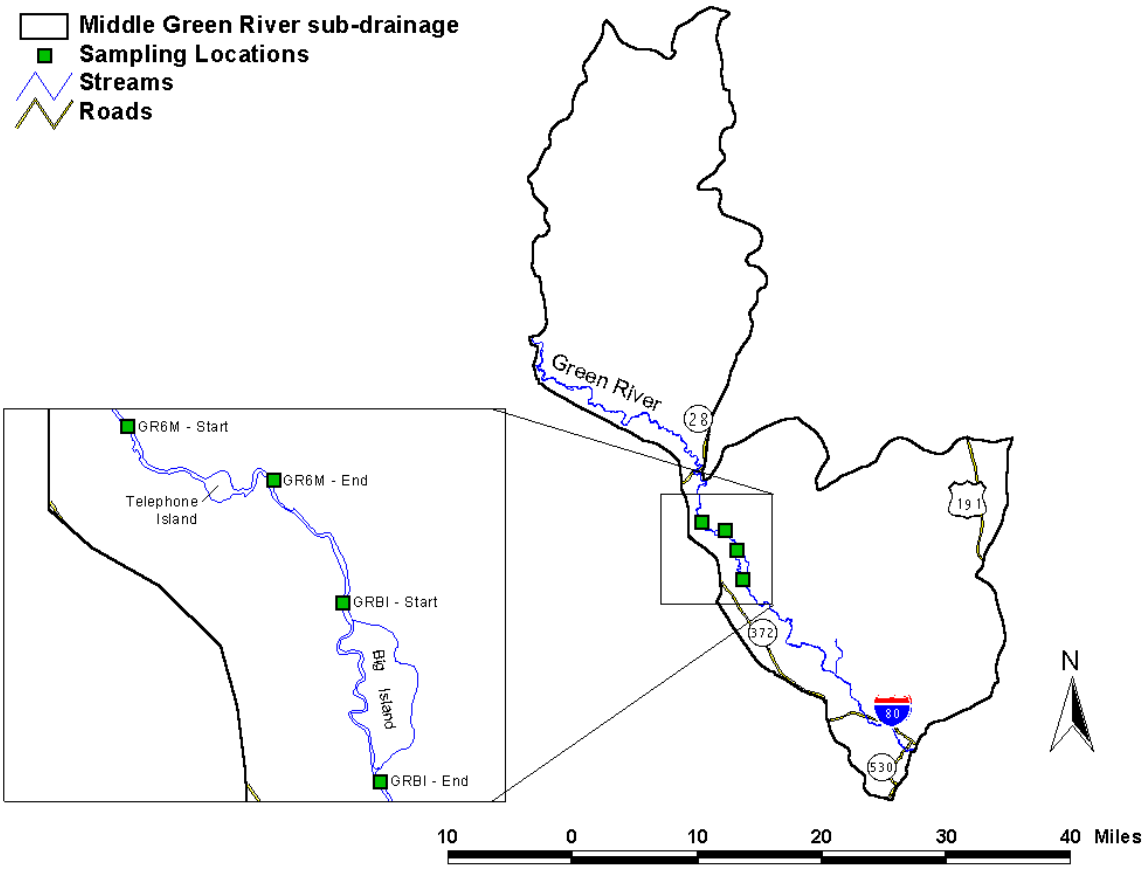

Figure 20.—Locations of sampling reaches in the Middle Green River sub-drainage.

A total of 17 fish species were collected between the two reaches (Appendix I). Five of the 17 species collected were native species (BHS, FMS, MWF, MSC, and SPD). Bluehead sucker and FMS were the only target species identified in the reaches. In addition, 25 FXW were identified (Appendix I).

All 17 fish species collected between the two reaches were represented in the electrofishing sampling, as were the five native species. One BHS was collected via electrofishing in the GR6M reach; FMS were collected via electrofishing in both reaches

(Appendix I). Twenty-three FXW were also collected via electrofishing between both reaches. Although BHS and FMS were collected in the GR6M reach, WHS dominated the sucker assemblage in the reach (Figure 21). Unlike sampling that took place on the Green River between FGR and Fontenelle Reservoir during summer 2002 (Keith et al. 2003), a few juvenile FMS were identified in the electrofishing sampling in 2003 (Figure 21 and Appendix I). But, no FMS were identified between five and 20 inches (Figure 21).

Similar results were observed in the GRBI reach. Although FMS, including juvenile individuals, were collected via electrofishing in GRBI, WHS dominated the sucker assemblage (Figure 22). Even though FMS ranged in length from 2.2 to 21.3 inches, no FMS were identified between five and 19 inches (Figure 22).

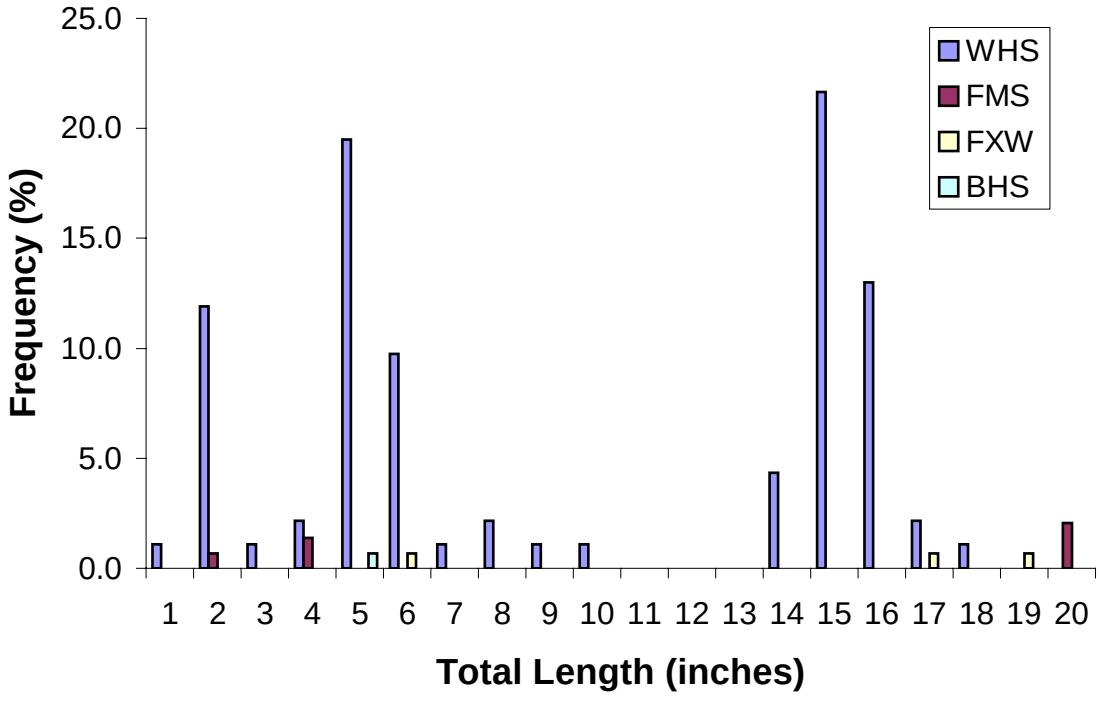

Figure 21.— Length-Frequency histogram for BHS, FMS, FXW, and WHS collected from the Green River in reach GR6M (electrofishing only).

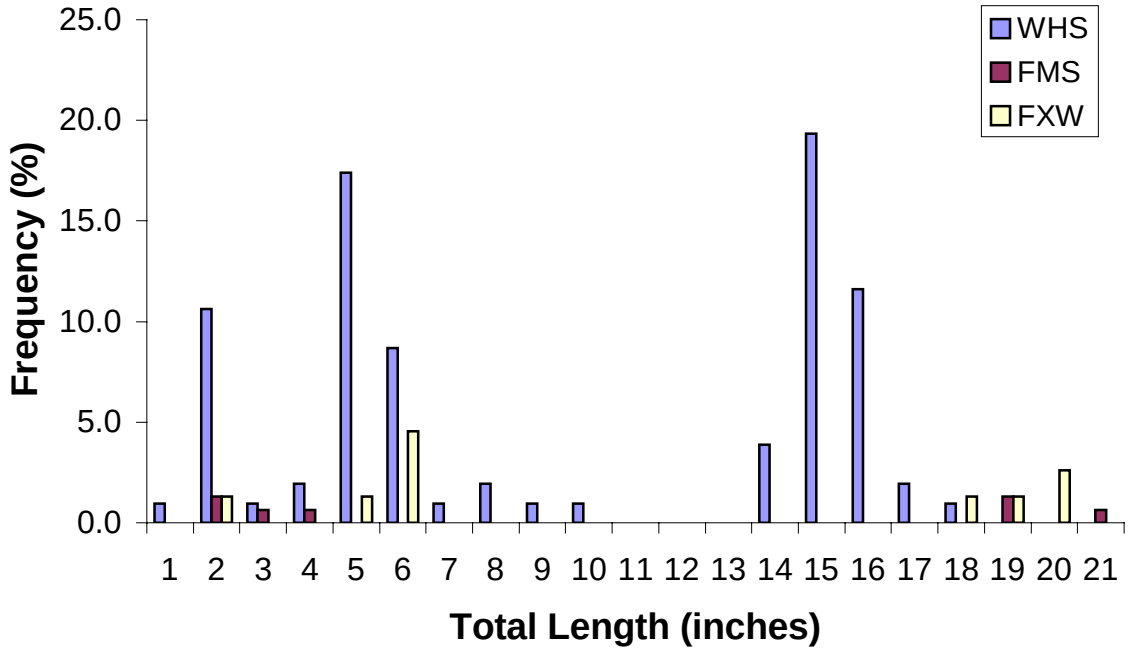

Figure 22.— Length-Frequency histogram for FMS, FXW, and WHS collected from the Green River in reach GRBI (electrofishing only).

Seven fish species, including two native species (FMS and SPD), were collected among five seine hauls conducted in the two reaches (Appendix I). Flannelmouth sucker was the only target species collected in the seine hauls (Appendix I). One FMS (3.1 in) was collected in the GR6M reach, two FMS (1.7 and 1.9 in) were collected in the GRBI reach (Appendix I). In addition, two FXW (2.0 and 2.5 in) were identified in GR6M. While seining was an effective method to capture small non-game species, no species were collected in seine hauls that were not collected via electrofishing.

Slate Creek sub-drainage

The Slate Creek sub-drainage drains an area of approximately 200 mi^2 in the western portion of the Green River watershed (Figure 2). Vegetative cover in the sub-drainage is dominated by Wyoming big sagebrush and to a lesser extent by mixed grass prairie. Land ownership in the sub-drainage is 96% public and 4% private. The BLM manages most (95.3%) of the public land. The remaining public land in the sub-drainage is owned by the State (4.1%) and the BOR (0.6%).

The mainstem of Slate Creek and North Fork Slate Creek were the only flowing portions of stream in mid-July 2003. No other tributaries in the sub-drainage contained perennial or standing water. Slate Creek was also dry from U.S. Route 189 downstream to the Green River.

Four reaches were sampled in the Slate Creek sub-drainage (Figure 23). Six fish species, including three native species (MTS, MSC, and SPD) were collected among the four reaches sampled in 2003 (Appendix J). No target species were collected.

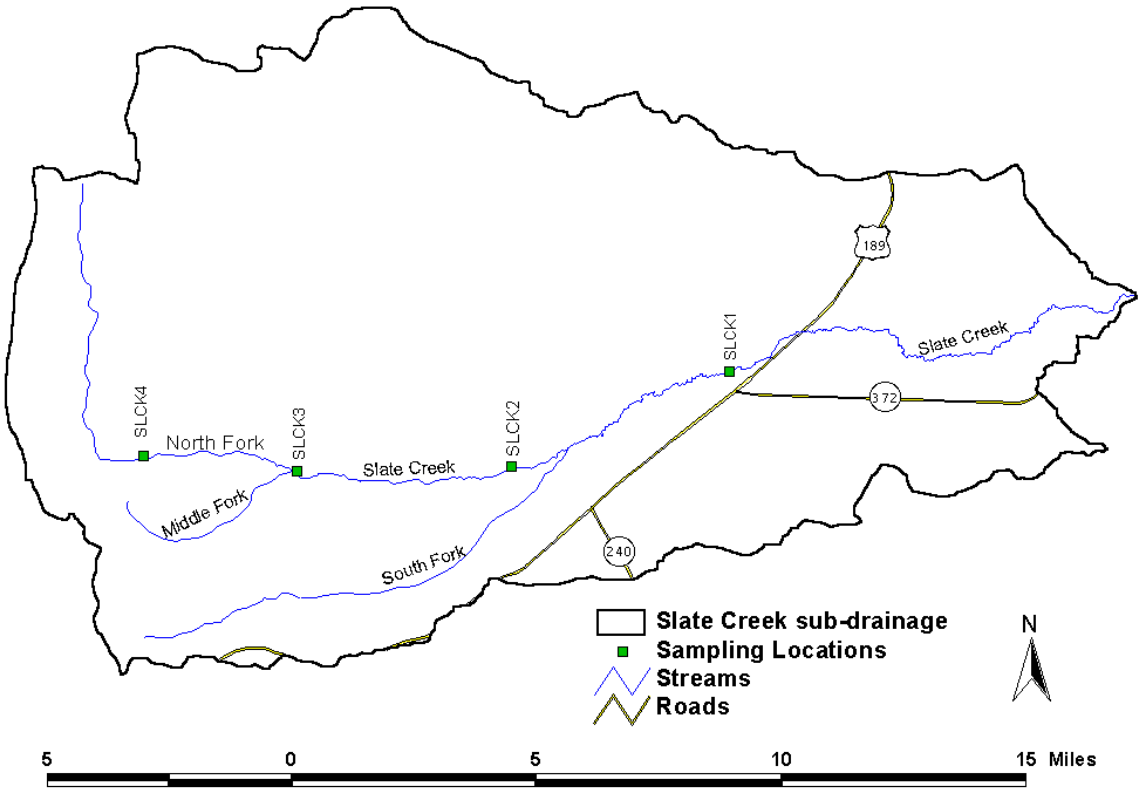

Figure 23.—Locations of reaches sampled in the Slate Creek sub-drainage in 2003.

Slate Creek

Four fish species, including two native species (MSC and SPD), were documented among the three reaches sampled on Slate Creek (Appendix J). Slate Creek was the only stream sampled in 2003 where the introduced leatherside chub (LSC) was identified. Leatherside chub may be hybridizing with native SPD in Slate Creek.

North Fork Slate Creek

Two native fish species (MSC and MTS) were identified among the four species collected in the reach sampled on North Fork Slate Creek (Appendix J). Non-native brook trout (BKT) and LSC were much more abundant in the reach than the native MTS and SPD (Appendix J).

SUMMARY

All objectives outlined for phase II of the native non-game fish study have been met. In addition, objectives were met in portions of three sub-drainages targeted for sampling in 2004.

The project biologist and two technicians sampled 60 stream reaches in seven sub-drainages in the Green River watershed to determine the distribution and abundance of BHS, FMS, and RTC (target species). Bluehead sucker and FMS were the only target species identified in 2003. Bluehead sucker were documented in nine stream reaches (Figure 4). Flannelmouth sucker were documented in 16 stream reaches (Figure 5). In general, BHS and FMS were only found in stream reaches that contained some deepwater habitat (maximum depth > 1.5 ft).

The collection of BHS in the Big Sandy and Middle Green River sub-drainages was encouraging. Surveys conducted in 1965 and 1995 (Wheeler 1997) did not sample the middle reaches of the Green River as we did. The only Green River sites sampled in these surveys were in the extreme upper and lower reaches of the river. However, these previous surveys did sample the Big Sandy River near the Green River confluence. This site is within five mi of the upstream end of the GR6M reach. Bluehead sucker were collected here in 1965, but not in 1995 (Wheeler 1997). Bluehead sucker are still present but rare in the middle Green River.

We found BHS in the Big Sandy River upstream of Big Sandy Reservoir and in the Little Sandy River upstream of the Eden Diversion. Previous surveys by Baxter and Wheeler did not sample within these stream reaches (Wheeler 1997). Miller (1978) sampled within these reaches and noted BHS in BSR, in the Big Sandy River upstream of Buckskin Crossing, and in the Little Sandy River upstream of the Eden Diversion. Miller's survey also noted RTC in the Big Sandy River upstream of Big Sandy Reservoir (Miller 1978). Bluehead sucker are still present but rare in the upper Big Sandy River

and upper Little Sandy Creek. However, RTC seem to have disappeared from the Big Sandy drainage.

Another surprise finding in 2003 was the existence of adult FMS in the upper Bitter Creek drainage (upstream of Point of Rocks). These represent the only population of FMS that is isolated from introduced WHS. Carter and Hubert (1995) sampled in this area in 1993 but only identified MTS and SPD. The fish community upstream of Point of Rocks is composed only of native species (FMS, MTS and SPD) and is apparently isolated by a physical barrier or dewatering. The fish assemblage in this stream reach is unique and should receive high conservation priority.

Length-frequency histograms were created for each target species when sufficient numbers were collected. Length-frequency distributions for the Big Sandy River, the Green River, and Bitter Creek displayed large gaps in length groups. On two reaches of the Big Sandy River a number of length groups were missing over the middle range of the histogram (Figure 8 and 9).

The native and non-native species composition was noted for all stream reaches sampled. In total, 16 non-native species and seven native species were identified in the 60 reaches sampled. It was extremely rare to find a stream portion that did not contain non-native species. In many reaches, non-native fish species were more prevalent than native species. However, there were instances where only native species were collected (e.g. upper Bitter Creek and the uppermost reach on the Henrys Fork).

A portion of left pelvic fin was clipped from all BHS, FMS, and suspected hybrids to determine the degree of hybridization occurring in FMS and BHS populations. Phenotypic evidence of hybridization between FMS and WHS was noted at eleven of the 60 stream reaches sampled during 2003 (Figure 5). Just over 56% of the sites where FMS were found also contained FXW. Hybridization between BHS and WHS was documented at three of the 60 stream reaches (Figure 4). Nearly 34 % of the sites where BHS were found also contained BXW. Analysis of the genetic samples should help determine the accuracy of phenotypic identification of native suckers and their hybrids. It will also help determine whether hybrids are sterile or are backcrossing with other individuals. For instance, Douglas and Douglas (2003) felt the majority of hybrids collected in Yampa River were first generation (F1) hybrids, indicating that backcrossing may not be occurring.

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Appendices

Appendix A.—Species codes and common and scientific names of fish species collected in the Green River Drainage, summer 2003.

Species Code	Common Name	Scientific Name
Native Species		
BHS	bluehead sucker	*Catostomus discobolus*
CRC	Colorado River cutthroat trout	*Oncorhynchus clarki pleuriticus*
FMS	flannelmouth sucker	*Catostomus latipinnis*
MSC	mottled sculpin	*Cottus bairdi*
MTS	mountain sucker	*Catostomus platyrhynchus*
MWF	mountain whitefish	*Prosopium williamsoni*
SPD	speckled dace	*Rhinichthys osculus*
Introduced Species		
BBT	burbot	*Lota lota*
BKT	brook trout	*Salvelinus fontinallis*
BNT	brown trout	*Salmo trutta*
BRC	Bonneville cutthroat trout	*Oncorhynchus clarki utah*
CRP	common carp	*Cyprinus carpio*
FHM	fathead minnow	*Pimephales promelas*
KOE	kokanee salmon	*Oncorhynchus nerka*
LKC	lake chub	*Couesius plumbeus*
LND	longnose dace	*Rhinichthys cataractae*
LSC	leatherside chub	*Gila copei*
RBT	rainbow trout	*Oncorhynchus mykiss*
RSS	redside shiner	*Richardsonius balteatus*
SMB	smallmouth bass	*Micropterus dolomieu*
SRC	Snake River finespotted cutthroat trout	*Oncorhynchus clarki behnkei*
UTC	Utah chub	*Gila atraria*
WHS	white sucker	*Catostomus commersoni*
Hybrids		
BXW	bluehead x white sucker hybrid	
FXW	flannelmouth x white sucker hybrid	
Other		
NFP	no fish present (collected) in the reach	

Appendix B.—Number and type of tissue sample collected from target species, in 2003, for genetic analysis.

		# Collected					
Species	**Stream**	**Fish**	**Fins**	**Fry**	**Location Description**	**Location**	**UTM**
FMS	Sage Creek		2		At the County Road 33 bend.	R107W, T15N, S9, NW1/4	12T 0627606E 4572512N
FXW	Sage Creek		1		At the County Road 33 bend.	R107W, T15N, S9, NW1/4	12T 0627606E 4572512N
FMS	Big Sandy River		26		West of Tabernacle Butte.	R105W, T29N, S25, NW1/4	12T 0629082E 4701255N
FXW	Big Sandy River		1		West of Tabernacle Butte.	R105W, T29N, S25, NW1/4	12T 0629082E 4701255N
BHS	Big Sandy River		7		West of Tabernacle Butte.	R105W, T29N, S25, NW1/4	12T 0629082E 4701255N
FMS	Big Sandy River		20		Just downstream from an old bridge crossing.	R106W, T28N, S30, SW1/4	12T 0622972E 4691490N
FMS	Big Sandy River		20		Between BSR and the USGS gauging station.	R106W, T27N, S17, SW1/4	12T 0625142E 4684810N
BHS	Big Sandy River		3		Between BSR and the USGS gauging station.	R106W, T27N, S17, SW1/4	12T 0625142E 4684810N
FMS	Big Sandy River			2	Southwest of Buckskin Crossing.	R106W, T30N, S25, NE1/4	12T 0629140E 4710768N
BHS	Big Sandy River		4		Southwest of Buckskin Crossing.	R106W, T30N, S25, NE1/4	12T 0629140E 4710768N
BXW	Big Sandy River		4		Southwest of Buckskin Crossing.	R106W, T30N, S25, NE1/4	12T 0629140E 4710768N
FMS	Big Sandy River		1		About 0.5 mi upstream of BSAR4.	R106W, T30N, S25, NE1/4	12T 0629161E 4711183N
FMS	Sculpin Creek		4		~ 1 mile upstream from the Big Sandy River.	R105W, T29N, S20, NE1/4	12T 0632704E 4703042N
FXW	Sculpin Creek		1		~ 1 mile upstream from the Big Sandy River.	R105W, T29N, S20, NE1/4	12T 0632704E 4703042N
BHS	Sculpin Creek		8		~ 1 mile upstream from the Big Sandy River.	R105W, T29N, S20, NE1/4	12T 0632704E 4703042N
BXW	Sculpin Creek		3		~ 1 mile upstream from the Big Sandy River.	R105W, T29N, S20, NE1/4	12T 0632704E 4703042N
FMS	Bitter Creek		2		~5 mi upstream of GR, between I80 and RR.	R106W, T18N, S21, NW1/4	12T 0635126E 4598736N
FXW	Bitter Creek		2		~5 mi upstream of GR, between I80 and RR.	R106W, T18N, S21, NW1/4	12T 0635126E 4598736N
FXW	Bitter Creek		2		Behind the Plaza Mall in Rock Springs.	R105W, T18N, S3, NE1/4	12T 0646762E 4603715N
FMS	Bitter Creek		24		About four mi southwest of Bitter Creek, WY.	R100W, T18N, S26, NE1/4	12T 0697129E 4597812N
FMS	Bitter Creek		31		Three miles south of Bitter Creek, WY.	R98W, T18N, S26, SW1/4	12T 0705897E 4597688N
FMS	Bitter Creek		1		Just west of Fort La Clede, WY.	R98W, T17N, S26, NW1/4	12T 0715519E 4588881N
FMS	Henrys Fork		10		< 1 mi downstream of Logan Hollow.	R110W, T12N, S5, NW1/4	12T 0597286E 4545053N
BHS	Henrys Fork		1		< 1 mi downstream of Logan Hollow.	R110W, T12N, S5, NW1/4	12T 0597286E 4545053N
FXW	Henrys Fork		3		Between Cottonwood Ck and USGS station.	R109W, T12N, S15, SW1/4	12T 0610689E 4541142N
BHS	Henrys Fork		8		Between Cottonwood Ck and USGS station.	R109W, T12N, S15, SW1/4	12T 0610689E 4541142N

Appendix B.—Continued.

Species	Stream	# Collected Fish	Fins	Fry	Location Description	Location	UTM
FMS	Little Sandy Ck.		1		North of Elkhorn Junction.	R104W, T29N, S28, SW1/4	12T 0643902E 4701310N
FXW	Little Sandy Ck.		6		North of Elkhorn Junction.	R104W, T29N, S28, SW1/4	12T 0643902E 4701310N
BXW	Little Sandy Ck.		1		North of Elkhorn Junction.	R104W, T29N, S28, SW1/4	12T 0643902E 4701310N
BHS	Little Sandy Ck.		14		Just south of Squaw Teat.	R104W, T27N, S5, NE1/4	12T 0644726E 4689597N
FMS	Little Sandy Ck.		7		Just south of Squaw Teat.	R104W, T27N, S5, NE1/4	12T 0644726E 4689597N
FXW	Little Sandy Ck.		3		Just south of Squaw Teat.	R104W, T27N, S5, NE1/4	12T 0644726E 4689597N
BHS	Little Sandy Ck.		13		Roughly 5 mi northeast of Eden Reservoir.	R105W, T27N, S26, SE1/4	12T 0640185E 4682587N
BXW	Little Sandy Ck.		1		Roughly 5 mi northeast of Eden Reservoir.	R105W, T27N, S26, SE1/4	12T 0640185E 4682587N
FMS	Little Sandy Ck.		11		Roughly 5 mi northeast of Eden Reservoir.	R105W, T27N, S26, SE1/4	12T 0640185E 4682587N
FXW	Little Sandy Ck.		3		Roughly 5 mi northeast of Eden Reservoir.	R105W, T27N, S26, SE1/4	12T 0640185E 4682587N
BXW	Green River		1		Just upstream of I-80 bridge.	R107W, T18N, S6, SE1/4	12T 0622482E 4602356N
FMS	Green River		1		6-mile boat launch to the first unnamed island downstream of Telephone Island.	R109W, T21N, S17, SE1/4	12T 0600600E 4627597N
BHS	Green River		1		6-mile boat launch to the first unnamed island downstream of Telephone Island.	R109W, T21N, S17, SE1/4	12T 0601350E 4626994N
FMS	Green River		3		6-mile boat launch to the first unnamed island downstream of Telephone Island.	R109W, T21N, S21, NW1/4	12T 0601350E 4626994N
Totals		0	255	2			

Appendix C.—Location description of sampling reaches in the seven sub-drainages sampled in 2003.

Site ID	Elev.	Location	Location Description	Ownership
Big Sandy River sub-drainage				
BSR1	6652	R106, T26, S26	Roughly four miles downstream of Big Sandy Reservoir.	BOR
BSAR1	6767	R106, T27, S17	Between Big Sandy Reservoir and the USGS gauging station near Farson (Station 09213500, R106W, T27N, S17, NW1/4, Sublette County, WY).	BOR
BSAR2	6822	R106, T28, S30	Just downstream from an old bridge crossing.	State
BSAR3	6917	R105, T29, S25	West of Tabernacle Butte.	State
BSAR4	7106	R106, T30, S25	Southwest of Buckskin Crossing.	State
BSAR4A	7114	R106, T30, S25	About 0.5 mi upstream of BSAR4.	State
BSAR5	7462	R105, T30, S13	Northeast of Buckskin Crossing,, at stream ford near Long Draw.	State
SCCK1	6997	R105, T29, S20	About one mile upstream from the confluence with the Big Sandy River.	BLM
LSC1	6574	R106, T25, S27	Between Highway 191 and State Route 28.	BOR
LSC2	6679	R105, T26, S32	About four mi upstream of State Route 28, just downstream of Eden Canal.	BOR
LSC3	6811	R105, T27, S26	Roughly five mi northeast of Eden Reservoir.	BLM
LSC4	6899	R104, T27, S5	Just south of Squaw Teat.	State
LSC5	7080	R104, T29, S28	North of Elkhorn Junction.	BLM/State
LSC6	7952	R104, T30, S36	Immediately downstream of Jensen Meadows.	State
PCRP1	6685	R105, T25, S22	Just downstream of Eden Canal in a residual pool.	BOR
PC1	6722	R105, T25, S13	About three miles upstream of Eden Canal.	BLM
PC2	6830	R104, T26, S26	About one mile upstream of County Road 21.	BLM
PCRP2	6922	R103, T26, S10	Just over two miles downstream of the Sweetwater/Sublette County line.	State
PC3	7122	R102, T27, S11	Inside exclosure near South Pass	BLM
PC4	7134	R102, T27, S11	Meadow near South Pass	Private
JMC1	6781	R104, T26, S33	At an old bridge crossing about 1.5 mi upstream of the confluence with Pacific Creek.	BLM
JMC2	6967	R103, T25, S27	About two miles upstream of South Packsaddle Canyon, in a residual pool.	BLM
JMC3	7059	R103, T25, S29	Just downstream of the County Road 82 culvert, in a short residual pool.	Private
JMC4	7350	R102, T24, S24	In a small impoundment on the east side of Monument Ridge near Blind Canyon.	Private

Appendix C.—Continued.

Site ID	Elev.	Location	Location Description	Ownership
Bitter Creek sub-drainage				
BCL1	6111	R106, T18, S21	About five mi upstream of the confluence with the Green River, between I80 and the RR.	Private
BCL2	6234	R105, T18, S3	Behind the Plaza Mall in Rock Springs.	Private
BCL3	6247	R105, T17, S26	Just to the east of Elk Street in Rock Springs.	Private
BC1	6507	R101, T20, S28	Just west of Point of Rock.	BLM
BC2	6660	R100, T18, S26	About four mi southwest of Bitter Creek, WY.	BLM
BC3	6735	R98, T18, S26	Three miles south of Bitter Creek, WY.	BLM
BC4	6797	R98, T17, S26	Just west of Fort La Clede, WY.	BLM
AC1	6801	R98, T17, S20	About two mi upstream of the confluence with Bitter Creek.	BLM
SWC1	6797	R102, T16, S31	Just downstream of Erickson Canyon.	BLM
SWC2	6960	R103, T14, S3	In canyon upstream of Gap Creek.	BLM
GC1	7066	R103, T14, S7	On the upstream side of County Road 27.	State
GC2	7276	R103, T14, S31	Beside County Road 27	BLM
KC1	6287	R105, T19, S26	Behind the Wyoming Wool Warehouse in Rock Springs.	Private
Eastside Tributaries sub-drainage				
SACK1	6050	R107, T15, S9	At the County Road 33 bend.	BLM
SACK2	6184	R107, T15, S14	Just downstream of the County Road 33 culvert.	BLM
MMC1	6050	R107, T13, S19	Electrofishing upstream of County Road 33 culvert, seining below culvert.	BLM
UMC1	6134	R107, T14, S32	Electrofishing upstream of County Road 33 culvert, seining below culvert.	BLM
Fontenelle Creek sub-drainage				
FC1	6689	R114, T24, S12	Approximately seven mi upstream of Fontenelle Reservoir.	Private
FC2	7060	R115, T24, S5	Just upstream of Fontenelle Gap.	Private
FC3	7284	R115, T25, S16	Near the Rock Creek confluence.	State
FC4	7544	R116, T26, S24	Just downstream of the Mahogany Creek confluence.	USFS
FC5	7747	R116, T26, S1	Just upstream of the Aspen Creek confluence.	USFS
FC6	7858	R116, T27, S35	Just below the stream ford.	USFS
DGC	7374	R115, T25 S25	About 2.5 miles upstream of Fontenelle Creek.	State

Appendix C.—Continued.

Site ID	Elev.	Location	Location Description	Ownership
Henrys Fork sub-drainage				
HF1	6076	R109, T12, S15	Between Cottonwood Creek and the USGS gauging station near Manila, UT (Station 09229500, R109W, T12N, S23, NW1/4, Sweetwater County, WY).	Private
HF2	6385	R110, T12, S2	~ 2.5 mi upstream of Antelope Wash, just upstream of power line.	Private
HF3	6530	R110, T12, S5	Less than one mi downstream of Logan Hollow.	Private
HF4	7205	R112, T12, S5	Between Coal Hollow and Lamb Creek.	Private
HF5	7509	R113, T13, S28	Just north of Lonetree, WY, on the north channel just downstream of SR 414.	Private
HF6	8342	R114, T12, S21	About one half mi downstream of the USFS boundary.	Private
Middle Green River sub-drainage				
GR6M	6225	R109, T21, S17	Began at 6-mile boat launch and continued to the first unnamed island downstream of Telephone Island.	FWS
GRBI	6208	R109, T21, S26	Began at Big Island Bridge and continued, following the west channel, to the Seedskadee National Wildlife Refuge boundary downstream of Big Island.	FWS
Slate Creek Sub-drainage				
SLCK1	6571	R113, T23, S15	Less than two mi upstream from U.S. Route 189.	State
SLCK2	6693	R113, T23, S26	Just upstream from Graham Reservoir.	BLM
SLCK3	6870	R115, T23, S25	Near the Middle Fork / North Fork Slate Creek confluence.	BLM
SLCK4	7249	R115, T23, S28	In the middle of the North Fork Slate Creek canyon.	BLM

Appendix D.— Summary information for reaches sampled in the Big Sandy River sub-drainage in 2003.

Stream Site ID	Date	Passes/ Gear Type[a]	Station Length (ft)	Station Width (ft)	Species	Number Caught	Length Range (in)	Status[b]
Big Sandy River								
BSR1	07/08/2003	1SB	656	13.8	FHM	258	1.3 - 2.8	I
					LKC	1	2.4	I
					RSS	68	2.2 - 3.8	I
					SPD	21	2.4 - 3.5	N
					WHS	2	2.8 - 3.5	I
BSAR1	08/19/2003	1SB	656	30.5	BBT	3	9.2 - 18.6	I
					BHS	3	3.0 - 3.5	N
					FMS	82	1.3 - 2.3	N
					MSC	10	1.5 - 4.2	N
					RSS	5	1.0 - 3.6	I
					SPD	2	1.4 - 2.9	N
					WHS	57	1.3 - 7.4	I
BSAR2	08/19/2003	1SB	656	22.6	FMS	73	1.4 - 20.2	N
					MSC	22	1.5 - 4.9	N
					MTS	1	3.0	N
					WHS	7	1.8 - 16.9	I
BSAR3	08/21/2003	1SB	656	39.0	BHS	7	2.6 - 3.5	N
					FMS	164	1.2 – 20.5	N
					FXW	1	1.9	H
					MSC	49	1.6 - 3.7	N
					MTS	2	2.9 - 3.0	N
					MWF	1	3.1	N
					RSS	1	1.2	I
					SPD	29	1.2 - 3.0	N
					WHS	17	1.3 - 2.1	I
BSAR4	06/12/2003	1SB/0.5BS	656	55.1	BHS	3	14.4 - 16.6	N
					MSC	37	2.0 - 3.6	N
					SPD	22	1.5 - 2.9	N
BSAR4	08/20/2003	1SB	656	32.8	BHS	1	3.6	N
					BXW	4	4.0 - 5.1	H
					FMS	2	1.6 - 1.9	N
					LKC	2	1.5 - 2.2	I
					MSC	88	1.4 - 3.6	N
					MTS	1	2.8	N
					RBT	2	2.4 - 15.4	I
					SPD	22	1.3 - 3.1	N
					WHS	7	1.3 - 7.6	I

[a]The numeral indicates the number of passes completed or nets used. The letter code indicates the type of gear used: SB=shore-based electrofishing equipment, BS=bag seine, and GN=gillnet.
[b]N=native, I=introduced, and H=hybrid.

Appendix D.—Continued.

Stream Site ID	Date	Passes/ Gear Type[a]	Station Length (ft)	Station Width (ft)	Species	Number Caught	Length Range (in)	Status[b]
BSAR4A	08/21/2003	3SB	144	34.1	FMS	1	17.5	N
					RBT	2	13.2 - 15.9	I
					WHS	8	15.2 - 17.6	I
BSAR5	08/22/2003	1SB	656	33.5	BKT	3	5.6 - 6.1	I
					BNT	2	2.6 - 5.8	I
					MSC	4	2.1 - 3.3	N
					RBT	1	10.7	I
Sculpin Creek								
SCCK1	08/20/2003	1SB	656	3.3	BHS	8	2.7 - 5.5	N
					BXW	3	3.9 - 4.7	H
					FMS	4	3.3 - 4.5	N
					FXW	1	9.4	H
					LKC	173	1.3 - 5.2	I
					MSC	1	4.6	N
					MTS	20	2.8 - 5.1	N
					MWF	1	3.3	N
					RSS	18	2.0 - 3.9	I
					SPD	15	2.4 - 3.7	N
					WHS	104	1.2 - 7.4	I
Little Sandy Creek								
LSC1	07/08/2003	1SB	656	18	FHM	22	1.7 - 2.4	I
					LKC	20	1.9 - 3.2	I
					MTS	1	3.2	N
					RSS	27	2.2 - 3.7	I
					SPD	18	1.9 - 3.2	N
					UTC	2	3.7 - 3.9	I
					WHS	25	3.2 - 8.4	I
LSC2	06/25/2003	1SB	656	10.5	FHM	378	1.4 - 2.8	I
					MTS	9	2.7 - 4.8	N
					RBT	1	2.7	I
					RSS	128	1.8 - 3.5	I
					SPD	18	1.9 - 3.1	N
					WHS	85	2.4 - 6.5	I
LSC3	07/09/2003	1SB	656	15.4	BHS	13	2.0 - 10.9	N
					BXW	1	12.7	
					FMS	11	6.5 - 15.6	N
					FXW	3	5.6 - 16.3	
					LKC	19	1.4 - 3.8	I
					RSS	180	1.3 - 4.2	I
					SPD	73	1.8 - 3.8	N

[a]The numeral indicates the number of passes completed or nets used. The letter code indicates the type of gear used: SB=shore-based electrofishing equipment, BS=bag seine, and GN=gillnet.
[b]N=native, I=introduced, and H=hybrid.

Appendix D.—Continued.

Stream Site ID	Date	Passes/ Gear Type[a]	Station Length (ft)	Station Width (ft)	Species	Number Caught	Length Range (in)	Status[b]
					UTC	1	4.7	I
					WHS	81	2.6 - 15.0	I
LSC4	07/10/2003	1SB	705	17.1	BHS	14	2.6 - 8.5	N
					FMS	7	3.1 - 8.2	N
					FXW	3	5.5 - 15.1	
					LKC	42	1.8 - 5.1	I
					MSC	4	3.5 - 4.3	N
					RSS	258	1.7 - 3.3	I
					SPD	55	2.0 - 3.2	N
					WHS	127	2.4 - 13.4	I
LSC5	07/10/2003	1SB	656	17.1	BNT	5	2.0 - 14.6	I
					BXW	1	8.1	
					FMS	1	15.6	N
					FXW	6	11.4 - 17.1	
					LKC	3	2.1 - 2.2	I
					MSC	3	3.3 - 3.8	N
					RSS	69	1.5 - 3.7	I
					SPD	19	1.9 - 3.0	N
					WHS	50	2.6 - 13.5	I
LSC6	07/11/2003	1SB	656	24.2	BKT	54	1.7 - 8.9	I
					BNT	13	4.0 - 16.8	I
					MSC	111	1.8 - 5.2	N
Pacific Creek								
PCRP1	08/13/2003	1BS	249	6.2	FHM	6	1.3 - 2.6	I
					LKC	19	1.7 - 3.3	I
					RSS	3	2.4 - 2.5	I
					SPD	1	3.2	N
					UTC	5	2.8 - 4.0	I
					WHS	5	4.8 - 6.2	I
PC1	07/02/2003	1SB/0.5BS	656	6.6	FHM	1	2.4	I
					LKC	26	1.7 - 3.6	I
					RSS	1	2.5	I
					SPD	4	1.6 - 2.7	N
					WHS	4	4.3 - 5.4	I
PC2	07/01/2003	1SB	656	4.6	FHM	18	1.5 - 2.7	I
					LKC	155	1.5 - 4.1	I

[a]The numeral indicates the number of passes completed or nets used. The letter code indicates the type of gear used: SB=shore-based electrofishing equipment, BS=bag seine, and GN=gillnet.
[b]N=native, I=introduced, and H=hybrid.

Appendix D.—Continued.

Stream Site ID	S Date	Passes/ Gear Type[a]	Station Length (ft)	Station Width (ft)	Species	Number Caught	Length Range (in)	Status[b]
					MTS	24	1.9 - 3.8	N
					SPD	112	1.4 - 3.0	N
					WHS	112	2.2 - 8.3	I
PCRP2	08/13/2003	1SH	246	10.8	FHM	373	0.9 - 2.6	I
					LKC	44	1.7 - 3.9	I
					MTS	6	3.1 - 4.7	N
					RSS	20	2.3 - 3.1	I
					WHS	189	3.2 - 6.9	I
PC3	07/01/2003	1SB	656	3.6	BKT	11	3.9 - 11.1	I
					LKC	27	2.0 - 3.0	I
					MTS	67	3.2 - 4.1	N
					SPD	1	3.1	N
PC4	08/12/2003	1SB	656	6.9	BKT	63	4.1 - 11.9	I
					LKC	187	2.4 - 4.0	I
					MTS	104	3.3 - 6.9	N
					SPD	1	3	N
Jack Morrow Creek								
JMC1	06/24/2003	1BS	315	23.0	NFP		-	
JMC2	08/11/2003	1BS	672	11.0	NFP		-	
JMC3	06/24/2003	2BS	108	29.9	FHM	115	1.2 - 2.5	I
					MTS	9	3.2 - 4.4	N
					RSS	50	1.3 - 4.3	I
					WHS	10	2.8 - 11.1	I
JMC4	06/26/2003	3GN	951	52.8	NFP		-	

[a]The numeral indicates the number of passes completed or nets used. The letter code indicates the type of gear used: SB=shore-based electrofishing equipment, BS=bag seine, and GN=gillnet.
[b]N=native, I=introduced, and H=hybrid.

Appendix E.— Summary information for reaches sampled in the Bitter Creek sub-drainage in 2003.

Stream Site ID	Date	Passes/ Gear Type[a]	Station Length (ft)	Station Width (ft)	Species	Number Caught	Length Range (in)	Status[b]
Bitter Creek								
BCL1	09/03/2003	1SB	656	14.8	CRP	5	2.5 - 4.0	I
					FMS	2	2.7 - 6.3	N
					FXW	2	2.6 - 6.0	H
					SPD	2	1.8 - 2.0	N
					UTC	54	1.6 - 7.8	I
					WHS	30	1.6 - 8.1	I
BCL2	09/04/2003	1SB	656	19.7	FHM	16	1.9 - 2.8	I
					FXW	2	3.8 - 5.3	H
					UTC	14	1.9 - 4.9	I
					WHS	6	2.8 - 6.1	I
BCL3	09/04/2003	1SB	656	11.8	FHM	667	0.9 - 2.8	I
					RSS	1	2.0	I
					UTC	37	1.7 - 4.7	I
BC1	07/30/2003	1SB	656	5.6	MTS	145	2.7 - 5.9	N
					SPD	299	1.3 - 3.8	N
BC2	07/31/2003	1SB	656	5.3	FMS	24	2.8 - 13.5	N
					MTS	50	2.2 - 5.6	N
					SPD	19	1.1 - 4.4	N
BC3	07/31/2003	1SB	656	7.2	FMS	45	2.8 - 15.1	N
					MTS	80	2.2 - 4.8	N
					SPD	409	1.1 - 4.4	N
BC4	09/03/2003	1SB	656	3.6	FMS	1	11.1	N
					MTS	77	1.4 - 5.1	N
					SPD	376	1.0 - 3.8	N
AC1	09/05/2003	1SB	656	2.5	MTS	51	2.4 - 6.7	N
					SPD	48	1.3 - 3.8	N
Salt Wells Creek								
SWC1	09/15/2003	1BS	108	11.5	FHM	1475	0.7 - 2.5	I
					MTS	9	3.8 - 5.2	N
					SPD	14	1.3 - 3.5	N
					WHS	117	3.0 - 8.4	I
SWC2	09/15/2003	1BS	144	11.1	FHM	483	0.9 - 2.5	I
Gap Creek								
GC1	08/14/2003	1SB	656	18.7	FHM	89	0.9 - 3.1	I
					MTS	126	1.7 - 6.4	N
					SPD	19	2.0 - 3.9	N
GC2	08/14/2003	1BS	184	6.6	NFP			
Killpecker Creek								
KC1	09/05/2003	1SB	656	6.9	NFP			

[a]The numeral indicates the number of passes completed. The letter code indicates the type of gear used: SB=shore-based electrofishing equipment, BS=bag seine.
[b]N=native, I=introduced, and H=hybrid.

Appendix F.— Summary information for reaches sampled in the Eastside tributaries sub-drainage in 2003.

Stream Site ID	Date	Passes/ Gear Type[a]	Station Length (ft)	Station Width (ft)	Species	Number Caught	Length Range (in)	Status[b]
Sage Creek								
SACK1	06/18/2003	1SB/0.5BS	656	4.9	FHM	6	1.7 - 2.2	I
					FMS	2	3.2 - 3.5	N
					FXW	1	2.9	H
					LND	3	1.9 - 2.6	I
					MTS	22	2.4 - 3.9	N
					RSS	4	2.1 - 2.4	I
					WHS	28	2.2 - 3.2	I
SACK2	06/18/2003	1SB/0.5BS	656	6.6	MTS	185	1.8 - 5.7	N
Middle Marsh Creek								
MMC1*	07/29/2003	1BS	40	30.5	RBT	2	7.2 - 9.1	I
					WHS	6	4.8 - 6.2	I
MMC1**	07/29/2003	1SB	656	1.1	NFP	-	-	-
Upper Marsh Creek								
UMC1*	06/19/2003	1BS	-	<15	NFP	-	-	-
UMC1**	06/19/2003	1SB	656	1.3	NFP	-	-	-

[a]The numeral indicates the number of passes completed or nets used. The letter code indicates the type of gear used: SB=shore-based electrofishing equipment, BS=bag seine.
[b]N=native, I=introduced, and H=hybrid.
*Pool below County Road 33 culvert.
**Electrofishing reach upstream of County Road 33 culvert.

Appendix G.— Summary information for reaches sampled in the Fontenelle Creek sub-drainage in 2003.

Stream Site ID	Date	Passes/ Gear Type[a]	Station Length (ft)	Station Width (ft)	Species	Number Caught	Length Range (in)	Status[b]
Fontenelle Creek								
FC1	09/17/2003	1BP	656	23.2	BNT	12	8.9 - 21.5	I
					FHM	1	2.8	I
					LKC	43	1.9 - 5.1	I
					MSC	182	1.8 - 5.0	N
					MTS	32	3.3 - 6.4	N
					MWF	24	7.8 - 15.4	N
					RBT	7	7.0 - 15.9	I
					RSS	77	1.6 - 4.0	I
					SPD	69	1.4 - 6.8	N
					SRC	1	14.6	I
					WHS	12	1.7 - 6.9	I
FC2	08/27/2003	1BP	722	25.4	MSC	66	1.3 - 5.1	N
					MTS	4	2.2 - 4.7	N
					RBT	3	2.4 - 14.8	I
					RSS	10	1.3 - 3.9	I
					SPD	63	1.4 - 3.5	N
FC3	08/27/2003	1BP	656	24.9	BNT	1	17.0	I
					LKC	1	3.0	I
					MSC	83	1.2 - 4.4	N
					MTS	31	1.6 - 6.9	N
					MWF	5	3.6 - 14.1	N
					RBT	4	2.9 - 12.5	I
					RSS	15	1.0 - 3.6	I
					SPD	117	0.9 - 4.7	N
FC4	08/26/2003	1BP	656	17.4	BKT	1	7.4	I
					MSC	37	1.3 - 4.7	N
					MTS	35	3.4 - 7.6	N
					RBT	12	1.8 - 14.1	I
					SPD	16	1.9 - 3.2	N
FC5	08/26/2003	1BP	656	20.5	BKT	4	3.5 - 15.4	I
					MSC	140	2.2 - 5.6	N
					MTS	1	4.9	N
					RBT	5	2.5 - 15.7	N
FC6	08/28/2003	1BP	656	11.3	BKT	84	2.4 - 17.4	I
					MSC	50	1.7 - 4.8	N
Dutch George Creek								
DGC	07/17/2003	1BP	656	5.0	NFP			

[a]The numeral indicates the number of passes completed. The letter code indicates the type of gear used: BP=backpack electrofishing unit.
[b]N=native, I=introduced, and H=hybrid.

Appendix H.— Summary information for reaches sampled in the Henrys Fork sub-drainage in 2003.

Stream Site ID	Date	Passes/ Gear Type[a]	Station Length (ft)	Station Width (ft)	Species	Number Caught	Length Range (in)	Status[b]
Henrys Fork								
HF1	07/22/2003	1SB	656	29.5	BHS	9	4.4 - 7.0	N
					FHM	1	2.1	I
					FXW	3	6.4 - 7.4	H
					MSC	27	3.0 - 4.1	N
					RSS	13	1.5 - 2.9	I
					SPD	39	2.3 - 3.3	N
					WHS	15	4.0 - 9.5	I
HF2	07/22/2003	1SB	738	27.6	MTS	6	4.1 - 5.2	N
					RSS	18	1.3 - 3.4	I
					SPD	9	2.2 - 3.5	N
					WHS	4	3.3 - 4.3	I
HF3	07/23/2003	1SB	656	37.4	BHS	1	5.9	N
					FMS	10	5.4 - 20.8	N
					MSC	23	3.0 - 4.7	N
					MTS	9	2.8 - 6.1	N
					RSS	156	1.5 - 3.5	I
					SPD	31	2.2 - 4.7	N
					WHS	64	2.2 - 6.3	I
HF4	07/25/2003	1SB	656	28.9	MSC	9	2.7 - 4.5	N
					MTS	1	4.8	N
					SPD	86	2.2 - 4.3	N
HF5	09/11/2003	1SB	705	12.8	CRC	1	9.2	N
					MSC	69	1.5 - 5.7	N
					MTS	66	0.9 - 5.9	N
					RSS	3	1.9 - 2.2	I
					SPD	16	1.0 - 2.8	N
HF6	07/24/2003	1SB	656	30.8	CRC	25	3.7 - 11.6	N
					MSC	138	1.8 - 4.9	N
					MTS	18	3.2 - 7.4	N

[a]The numeral indicates the number of passes completed. The letter code indicates the type of gear used: SB=shore-based electrofishing equipment.
[b]N=native, I=introduced, and H=hybrid.

Appendix I.—Summary information for reaches sampled in the middle Green River sub-drainage in 2003.

Stream Site ID	Date	Passes/ Gear Type[a]	Station Length (ft)	Station Width (ft)	Species	Number Caught	Length Range (in)	Status[b]
Green River								
GR6M	09/09/2003	1RF	16200	220	BHS	1	5.8	N
					BNT	6	3.1-22.4	I
					BRC	1	17.2	I
					CRP	7	2.0-31.5	I
					FHM	1	2.2	I
					FMS	6	2.5-20.9	N
					FXW	4	2.8-19.4	H
					KOE	1	16.7	I
					MWF	14	4.2-15.4	N
					RBT	3	5.7-7.0	I
					RSS	9	2.4-3.3	I
					SPD	9	2.3-4.0	N
					SRC	1	11.4	I
					WHS	108	1.9-18.9	I
GR6M	09/09/2003	2BS	~200	25	CRP	18	1.2-2.4	I
					FHM	52	0.9-2.0	I
					FMS	1	3.1	N
					FXW	2	2.0-2.5	H
					RSS	59	1.0-2.0	I
					UTC	29	1.3-2.2	I
					WHS	43	1.5-3.0	I
GRBI	09/10/2003	1RF	19800	220	BNT	22	3.4-17.8	I
					FHM	1	2.4	I
					FMS	7	2.2-21.3	N
					FXW	19	2.8-20.4	H
					KOE	9	15.7-24.8	I
					LND	5	2.2-3.3	I
					MWF	47	4.6	N
					MSC	1	4.4-16.9	N
					RBT	3	10.8-15.8	I
					RSS	152	1.5-3.7	I
					SMB	1	2.5	I
					SPD	3	2.9-3.2	N
					SRC	7	10.3-12.1	I
					UTC	1	2.2	I
					WHS	128		I

[a]The numeral indicates the number of passes completed. The letter code indicates the type of gear used: SB=shore-based electrofishing equipment.
[b]N=native, I=introduced, and H=hybrid.

Appendix I.—Continued.

Site ID	Date	Passes/ Gear Type[a]	Station Length (ft)	Station Width (ft)	Species	Number Caught	Length Range (in)	Status[b]
GRBI	09/10/2003	3BS	~300	25	CRP	30	0.9-2.6	I
					FHM	9	1.8-2.7	I
					FMS	2	1.7-1.9	N
					RSS	104	1.0-2.7	I
					SPD	1	1.6	N
					UTC	9	1.2-2.3	I
					WHS	43	1.3-2.4	I

[a]The numeral indicates the number of passes completed. The letter code indicates the type of gear used: RF=raft-fixed electrode, BS=bag seine.
[b]N=native, I=introduced, and H=hybrid.

Appendix J.— Summary information for reaches sampled in the Slate Creek sub-drainage in 2003.

Stream Site ID	Date	Passes/ Gear Type[a]	Station Length (ft)	Station Width (ft)	Species	Number Caught	Length Range (in)	Status[b]
Slate Creek								
SLCK1	07/15/2003	1DN	656	2.5	NFP		1.7 - 4.3	
SLCK2	07/15/2003	1SB	656	8.5	LSC	48	3.2	I
					MSC	1	1.6 - 3.9	N
					SPD	81	2.1 - 10.3	N
					WHS	87	2.4 - 5.2	I
SLCK3	07/16/2003	1SB	656	3.9	LSC	9	1.0 - 3.5	I
					MSC	31	1.8 - 4.5	N
					SPD	37	3.1 - 11.9	N
					WHS	4	2.3 - 9.6	I
SLCK4	07/16/2003	1SB	656	5.9	BKT	84	6.0 - 9.6	I
					LSC	30	4.4 - 5.3	I
					MSC	15	2.7 - 4.3	N
					MTS	4	4.9 - 5.8	N

[a]The numeral indicates the number of passes completed. The letter code indicates the type of gear used: DN=dip net, SB=shore-based electrofishing equipment.
[b]N=native, I=introduced, and H=hybrid.