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4.10 EVALUATION OF HATCHERY ORIGIN COHO SALMON BEHAVIOR, PRODUCTIVITY, AND HABITAT SELECTION IN THE UPPER LEWIS RIVER WATERSHED (AQU 10)

4.10.1 Study Objectives

This study tracked radio-tagged coho salmon from various release points in the upper Lewis River basin to:

- Identify holding and spawning locations for adult (hatchery origin) coho salmon;
- Determine migration behavior of hatchery origin coho salmon; and
- Distribute marine nutrients into the upper watershed.

4.10.2 Study Area

Coho were transported from the Lewis River Hatchery (RM 15.5) to several upper basin release points. The movements of these fish were tracked in Swift Reservoir (RM 48.0), the North Fork Lewis River upstream of Swift Reservoir to Lower Falls (RM 72.5), and tributaries to the North Fork Lewis River between Swift Reservoir and Lower Falls (Figure 4.10-1).

4.10.3 Methods

4.10.3.1 Marking and Transportation

Source fish for this study were captured from both the Merwin trap (at the base of Merwin Dam) and the Lewis River trap (at the Lewis River Hatchery). In total, 30 female and 60 male adult coho were used in this evaluation. Most coho were late (Type N) stock; however, some early (Type S) coho were used to ensure an adequate number of fish would be available. Fish with fungus near or on the eye were rejected. Only female fish were tagged for the study. MS-222 was used to anesthetize fish. Once anesthetized, female coho were inspected for scars and fungus, measured for length, and tagged with an Advanced Telemetry Systems® (ATS) radio transmitter (tag). Tagging data for these 30 fish are summarized in Table 4.10-2. Tags were inserted orally into the fish's stomach using a small PVC tube as a guide. A check of each tag was made with an ATS receiver before and after tag insertion. Female coho were then placed in fresh water to revive. Fish were held for 24 hours to determine tag loss, and all tags remained in position.

Adult coho were transported to the upper Lewis River (a distance of about 45 miles) in hatchery fish trucks provided by the Lewis River Hatchery. Two release locations were used – Eagle Cliff (RM 59.5) and Muddy River bridge (about 5.5 miles upstream of the Muddy River mouth) (Figure 4.10-1). In total, 15 tagged females and 30 males were planted at each site (Table 4.10-2). Tank water was tempered with colder water during transportation to reduce stress or shock to released coho (Table 4.10-1). Fish were transported individually from the hatchery trucks to the river using innertube sections

(sealed on one end) partially filled with water. A radio-check was made at each site after release of coho to ensure tag retention and operation.

Table 4.10-1. Fish tank and receiving water temperature for October 26 and 31, 2000 release dates.

Transport Date	Release Site	Temperature (°F)	
		Tank	Receiving Water
October 26	Eagle Cliff	54	46
	Muddy R.	53	48
October 31	Eagle Cliff	56	47
	Muddy R.	56	48

As part of this study, approximately 2,000 male coho were to be transplanted to the upper watershed to enhance the distribution of marine nutrients. Efforts to accomplish this task were made; however, WDFW hatchery personnel were unable to comply due to lack of funding (pers. comm., Robin Nicolay, WDFW, 10/29/00).

4.10.3.2 Monitoring

Monitoring of fish movement began on October 30, 2000 and continued weekly until December 4, 2000, as recorded in Table 4.10-3. Fish were tracked using foot, bike, and aerial surveys.

An ATS receiver, headphones, and directional hand held antenna were used to determine the location of each fish. An attempt was made to visually locate each fish and determine its behavior (e.g., redd construction) or status. Water clarity and access sometimes prohibited the the surveyor from visually locating or recording the exact location of each fish.

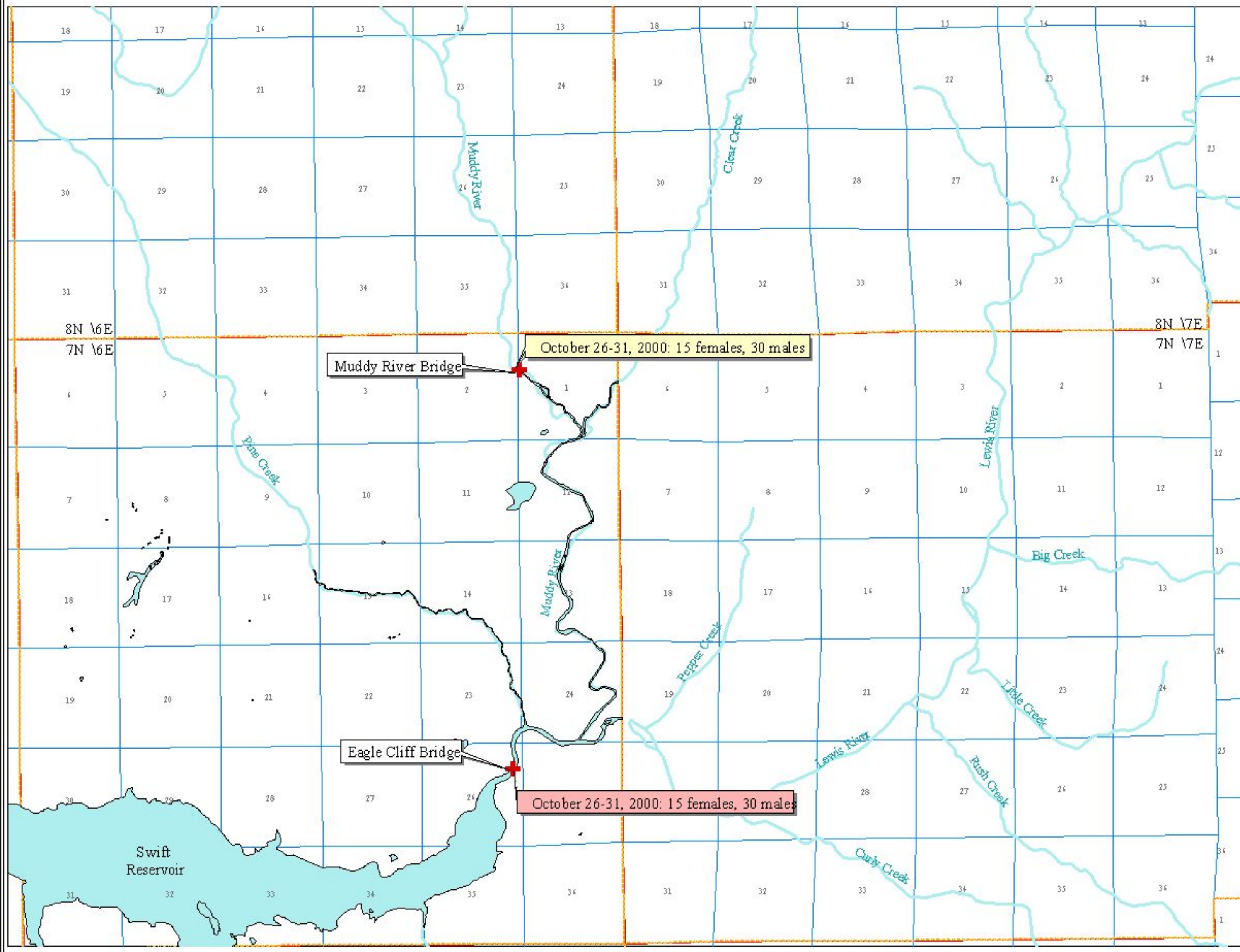
Fish locations were documented on standard 1:12,000 USGS quadrangles. A hand-held Global Positioning System (GPS) locator was used during all surveys to ensure proper location of each fish. This was especially helpful during aerial surveys.

4.10.3.3 Coho Movement Patterns

Fish location, movement, and redd location were documented using software provided by TOPO!®. For each tracking period, an electronic color map was generated detailing the location of each fish identified and any redds observed. Due to the size of the study area, most tracking periods require a series of 3 maps. Color was used to identify the release location of each fish. Yellow dots on the figures represent the Muddy River release, whereas red dots indicate an Eagle Cliff release.

Figure 4.10-1

**Location of Eagle Cliff
and Muddy River Bridge
Release Sites**



- Release Sites
- Muddy River Bridge Release
- Eagle Cliff Release

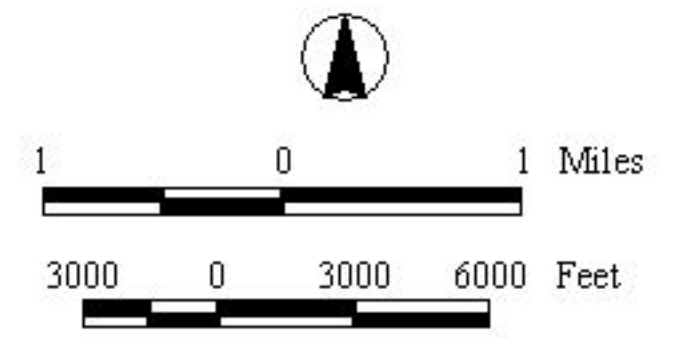


Table 4.10-2. Tagging summary of female coho documenting length, tag date, release date, release location, and tagger.

#	Frequency (Mhz)	Fish Length (cm, fork length)	Tag Date	Release Date	Release Location	Tagger	Notes
1	40.011	72.5	10/25/00	10/26/00	Eagle Cliff	Torell	
2	40.021	74.0	10/25/00	10/26/00	Muddy River	Torell	
3	40.031	71.5	10/25/00	10/26/00	Muddy River	Torell	
4	40.041	77.0	10/25/00	10/26/00	Eagle Cliff	Torell	
5	40.051	78.5	10/25/00	10/26/00	Eagle Cliff	Torell	
6	40.061	75.0	10/25/00	10/26/00	Eagle Cliff	Torell	
7	40.071	74.0	10/25/00;10/31/00	10/31/00	Muddy River	Lesko	Original tag fish length = 65.0 cm
8	40.081	76.0	10/25/00	10/26/00	Muddy River	Torell	seal marks
9	40.091	74.5	10/25/00	10/26/00	Eagle Cliff	Torell	
10	40.101	67.0	10/25/00	10/26/00	Muddy River	Torell	
11	40.110	72.5	10/25/00	10/26/00	Muddy River	Torell	
12	40.120	77.5	10/25/00	10/26/00	Eagle Cliff	Torell	seal marks
13	40.131	71.0	10/25/00	10/26/00	Eagle Cliff	Torell	
14	40.151	79.5	10/25/00	10/26/00	Eagle Cliff	Torell	
15	40.601	76.0	10/25/00	10/26/00	Muddy River	Torell	seal marks
16	40.621	76.0	10/25/00	10/26/00	Muddy River	Torell	
17	40.631	75.0	10/25/00	10/26/00	Eagle Cliff	Torell	
18	40.641	70.0	10/25/00	10/26/00	Eagle Cliff	Torell	
19	40.660	76.0	10/25/00	10/26/00	Muddy River	Torell	no AD clip, dark
20	40.681	72.0	10/25/00	10/26/00	Muddy River	Torell	condition good
21	40.700	75.0	10/25/00	10/26/00	Eagle Cliff	Torell	seal marks
22	40.711	65.5	10/25/00	10/26/00	Muddy River	Torell	seal marks
23	40.721	75.0	10/31/00	10/31/00	Muddy River	Lesko	
24	40.742	74.0	10/31/00	10/31/00	Muddy River	Lesko	bright
25	40.761	80.0	10/31/00	10/31/00	Muddy River	Lesko	
26	40.771	67.0	10/31/00	10/31/00	Eagle Cliff	Lesko	
27	40.781	76.0	10/31/00	10/31/00	Muddy River	Lesko	
28	40.801	79.0	10/31/00	10/31/00	Eagle Cliff	Lesko	bright
29	40.821	70.0	10/31/00	10/31/00	Eagle Cliff	Lesko	
30	40.841	73.0	10/31/00	10/31/00	Eagle Cliff	Lesko	

Table 4.10-3. Summary of monitoring activity of tagged fish.

Date	Activity
October 25, 2000	Tagged 22 female coho at Lewis River Hatchery.
October 26, 2000	Transported 22 female and 60 male adult coho to Muddy River and Eagle Cliff release sites (1 tag loss at Muddy River—reinserted on second release). Performed radio checks.
October 30, 2000	Rough check of fish transplanted on October 26, 2000.
October 31, 2000	Tagged and transported 9 female coho (5 to Muddy River, 4 to Eagle Cliff). Performed radio checks.
November 7, 2000	Radio tracking (foot).
November 14, 2000	Radio tracking (aerial).
November 22, 2000	Radio tracking (foot and bike).
November 28, 2000	Radio tracking (aerial).
December 4, 2000	Radio tracking (aerial).

4.10.4 Key Questions

This study will provide information to help address the following “key” questions identified during the Lewis River Cooperative Watershed Studies meetings:

- How may hatcheries be used to help restore naturally reproducing stocks of salmonids in the watershed?

The transportation of adult coho from the Lewis River Hatchery proved successful both from the perspective of limited mortality and the occurrence of natural spawning. This result may be species dependent (i.e., Chinook may not be as hardy), but the success of this program indicates that the use of hatcheries combined with transportation is a method that could be employed to restore naturally reproducing stocks.

- What physical, chemical, and biological conditions currently exist in project reservoirs or stream habitats that may affect anadromous fish movements and migrations, and how might potential impacts resulting from these conditions be reduced?

This study was not designed to answer this question.

- What types of reintroduction methods might be successful in the Lewis River watershed and what is the potential cost and engineering feasibility of each of these methods (e.g., trapping and hauling, construction of fishways, screening, stocking of fry, planting of eggs)?

This study showed that trap and haul of coho salmon remains a viable method to reintroduce coho into the upper watershed. Costs of the trap-and-haul facilities are reported in AQU-5.

- Is there potential for habitat enhancement to increase the quality and/or quantity of habitat that would become available to anadromous fish? Where might habitat enhancement occur and what types would be suitable for the watershed?

Muddy River is the preferred site for spawning coho. This stream is also one of the most heavily impacted by the eruption of Mount St. Helens in 1980. Therefore, it has the greatest potential for effective habitat enhancement programs. Bank stabilization is probably the most important enhancement that could occur at this time.

- What types of interspecific interactions may occur with various options for reintroducing anadromous fish?

Interactions between salmon are unknown at this time. Interactions between bull trout and introduced adult salmon appears limited based on spawning separation. Significant interactions between juvenile outmigrants may occur.

- How would reintroduction of anadromous fish affect bull trout and kokanee populations?

Coho seem to prefer the Muddy River system over all other areas. All redds were found in the lower reaches of Muddy River. Bull trout have not been observed in Muddy River, indicating that the interactions between spawning populations are likely insignificant. However, this study did not look at the potential effects of smolt interactions on juvenile bull trout (e.g., competition or predation), or the possibility of disease transmission from this study.

- What benefits to aquatic and terrestrial communities and ecosystems might accrue from the reintroduction of anadromous fish (e.g., nutrient enrichment of headwater streams, important seasonal food source for terrestrial species)?

Reintroduction of anadromous fishes would provide additional nutrients (specifically nitrogen) to the nutrient-poor waters upstream of Swift Reservoir. These benefits would likely extend beyond the aquatic system as terrestrial species (otter, mink, bear) feed on introduced fishes and provide additional nutrients (droppings) to riparian vegetation. Based on this study, the benefit appears to be limited to the Muddy River and mainstem Lewis River.

- Where do natural and artificial barriers to anadromous fish movement currently occur upstream of Swift Reservoir?

The question is answered in AQU 1.

4.10.5 Results

Data collection for this study is complete. Results of tracking radio tagged coho from October 30 to December 4, 2000 are summarized on maps in Figures 4.10-2 through 4.10-8. Tables (4.10-4 and 4.10-5) summarizing fish movement for each survey are also provided to facilitate review of the migratory behavior of individual fish.

Table 4.10-4. Summary of coho movements from the Eagle Cliff release in 2000 (bold text indicates significant movement).

General Location Of Coho Identified During Telemetry Surveys							
Frequency (Mhz)	30-OCT	31-OCT	7-NOV	14-NOV	22-NOV	28-NOV	4-DEC
40.011	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff
40.041	Eagle Cliff		Upper Swift Reservoir	Eagle Cliff	Upper Swift Reservoir		
40.051		Upper Swift Reservoir		Lewis River near Big Creek	Lewis River near Little Creek	Lewis River near Little Creek	Lewis River near Little Creek
40.061						Upper Swift Reservoir	Upper Swift Reservoir
40.091	Eagle Cliff	Eagle Cliff	Upper Swift Reservoir	Eagle Cliff	Eagle Cliff	Eagle Cliff	
40.120			Lewis River near Pine Creek	Lewis River near Pine Creek		Lower Muddy River	Lower Muddy River
40.131	Eagle Cliff	Eagle Cliff	Lewis River near Pine Creek	Eagle Cliff	Eagle Cliff	Lower Muddy River	Lewis River near Pepper Creek
40.151	Upper Swift Reservoir			Upper Swift Reservoir		Lower Muddy River	
40.631	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff	Upper Swift Reservoir	Eagle Cliff	
40.641	Eagle Cliff	Eagle Cliff	Lewis River near Pine Creek	Lewis River near Pine Creek	Eagle Cliff	Lewis River near Pine Creek	Upper Swift Reservoir
40.700	Eagle Cliff	Eagle Cliff	Lewis River near Curly Creek	Lewis River near Muddy River	Lewis River near Muddy River	Lower Muddy River	Lewis River near Muddy River
40.771	Not Applicable	Eagle Cliff	Eagle Cliff	Eagle Cliff	Lewis River near Pine Creek	Lewis River near Muddy River	Lewis River near Muddy River
40.801	Not Applicable	Eagle Cliff	Upper Swift Reservoir	Lower Muddy River		Lower Muddy River	Lower Muddy River
40.821	Not Applicable	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff
40.841	Not Applicable	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff

NOTE: Lower Muddy River defined as downstream of Muddy River Bridge

Table 4.10-5. Summary of coho movements from the Muddy River release in 2000 (bold text indicates significant movement).

General Location Of Coho Identified During Telemetry Surveys							
Frequency (Mhz)	30-OCT	31-OCT	7-NOV	14-NOV	22-NOV	28-NOV	4-DEC
40.021	Muddy River Bridge	Muddy River Bridge	Muddy River Bridge	Lower Muddy River	Lower Muddy River	Lower Muddy River	Lower Muddy River
40.031	Upper Swift Reservoir	Upper Swift Reservoir	Eagle Cliff	Eagle Cliff		Lower Muddy River	
40.071	Not Applicable	Muddy River Bridge	Muddy River Bridge	Lower Muddy River	Lower Muddy River	Upper Muddy River	Upper Muddy River
40.081						Lewis River near Pepper Creek	Lewis River near Pepper Cr.
40.101	Lower Muddy River					Lower Muddy River	
40.110	Upper Muddy River	Muddy River Bridge	Muddy River Bridge	Lower Muddy River		Lower Muddy River	Lower Muddy River
40.601					Upper Swift Reservoir		
40.621	Muddy River Bridge	Muddy River Bridge	Upper Muddy River	Upper Muddy River			Lower Muddy River
40.660	Muddy River Bridge	Muddy River Bridge	Muddy River Bridge	Upper Muddy River	Upper Muddy River	Lower Muddy River	Lewis R near Pine Creek
40.681	Lewis River near Pine Creek	Lewis River near Pine Cr.	Lewis River near Pine Creek	Eagle Cliff		Upper Swift Reservoir	Upper Swift Reservoir
40.711	Muddy River Bridge	Muddy River Bridge	Upper Muddy River	Lower Muddy River		Lower Muddy River	Lower Muddy River
40.721	Not Applicable	Muddy River Bridge	Muddy River Bridge	Lewis River near Muddy River		Lower Muddy River	
40.742	Not Applicable	Muddy River Bridge	Muddy River Bridge	Upper Muddy River	Upper Muddy River	Upper Muddy River	Upper Muddy River
40.761	Not Applicable	Muddy River Bridge	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff	Eagle Cliff
40.781	Not Applicable	Muddy River Bridge	Muddy River Bridge	Upper Muddy River	Upper Muddy River	Lower Muddy River	Lower Muddy River

NOTE: Upper and Lower Muddy River defined as upstream or downstream of Muddy River Bridge

Significance of fish movement is defined in this report as: (1) fish moving from one stream to another (e.g., Lewis River to Muddy River); or (2) fish moving more than 2 miles (3.2 km).

Most fish tended to stay near their release locations; however, fish that began to move usually moved significant distances. Two fish identified by frequencies 40.031 and 40.700 were quite active during the study. Fish 40.031 traveled from the Muddy River bridge to Swift Reservoir and then returned to Muddy River. Fish 40.700 ascended the mainstem Lewis River from Eagle Cliff to Curly Creek Falls, but then fell back to the mouth of the Muddy River. Fish 40.051 ascended the farthest by reaching the mouth of Big Creek (RM 67) on November 14 – still some 5.5 miles downstream of Lower Falls. Tables 4.10-4 and 4.10-5 provide individual records of fish movement during the surveys.

4.10.6 Discussion

Two factors were used to describe movements of tagged coho: significant movement (over 2 miles or from one stream to another) and areas of congregation.

Muddy River appeared to be the preferred area for spawning during this study. Of the 15 coho released at Eagle Cliff, 5 were later found in the Muddy River. Of those released in the Muddy River, 11 of the original 15 stayed in the Muddy River during the study period. Therefore, from this study, it appears that the Muddy River system is preferred by coho over other tributaries upstream of Swift Reservoir. The reason for this preference is unknown, but studies in 1956 by Chambers indicated that the Muddy River and tributaries (Clearwater, Clear and Smith creeks) were the main spawning tributary upstream of the Eagle Cliff area used by coho.

Migration of adult coho varied widely. Four of the 15 coho released into the Muddy River traveled to Swift Reservoir. One of these fish returned to Muddy River after about 14 days at the upper end of Swift Reservoir. The coho (40.051) that ascended the farthest upstream of Swift Reservoir (near the mouth of Big Creek) spent the most time near the Bolt Camp area (between the confluence of Little and Rush creeks). This is interesting, because data collected in 1956 (Chambers) showed that released coho also stopped at this location and actually constructed 3 redds in the vicinity of Bolt Camp. Why fish choose to hold and apparently spawn in this area of the Lewis River mainstem is unknown.

Redds were detected near the mouth of the Muddy River and at Eagle Cliff. While it is expected that spawning occurred in other tributaries, many of these tributaries have dense riparian cover, which made redd identification difficult. Therefore, the presence of redds in the Muddy and mainstem Lewis may be a function of the ability to identify redds and not necessarily related to spawning preference. However, the lack of tag detections in tributaries other than the Muddy River indicate that these streams did not support spawning activity greater than what was observed in the Muddy River.

4.10.7 Schedule

This study is complete.

4.10.8 References

Chambers, J.S. 1957. Report on the 1956 Survey of the North Fork of the Lewis River above Yale Dam. State of Washington Department of Fisheries. Prepared for Pacific Power and Light.

PacifiCorp and Cowlitz PUD. 2001. 2000 Technical Study Status Reports for the Lewis River Hydroelectric Projects. Portland, OR and Longview, WA. March 2001.

4.10.9 Comments and Responses on Draft Report

This section presents stakeholder comments provided on the draft report, followed by the Licensees' responses. The final column presents any follow-up comment offered by the stakeholder and in some cases, in italics, a response from the Licensees.

Commenter	Volume	Page/ Paragraph	Statement	Comment	Response	Response to Responses
USDA Forest Service: John Kinney	1	AQU 10-1	Objective 1: Identify holding and spawning locations for adult (hatchery origin) coho salmon.	It was our understanding that this information was not collected or was inconclusive. Therefore, a plan was developed to survey several tributaries during the 2002 field season for the presence of juvenile coho salmon. <i>This study is incomplete.</i>	Additional data is being collected in 2002 to supplement this report.	
WDFW – JIM BYRNE	1	AQU 10-1	Adult Coho Tracking.	Only 3 or 4 (10-13%) redds were identified from 30 females, who can make multiple redds each. There were no sightings of carcasses, so no idea of final nutrient disposition. Not sure all objective were met.	This was not a performance objective. Nutrients were distributed; therefore, the objective was met.	My comments refer to Phase 2 (2001) 3 Objectives (10-1) were listed; identify spawning locations, Determine migration, distribute nutrients. The first two objectives were not addressed. 60 radio tagged adults will not distribute many nutrients. Perhaps 2,000 carcasses would distribute nutrients (see below). Licensees' Response: <i>The first objective, to identify holding and spawning locations, was accomplished to the extent possible. Redd locations were identified. The second objective was to determine migratory behavior of coho. The movement of fish is reported in the Results section of this report.</i>

Commenter	Volume	Page/ Paragraph	Statement	Comment	Response	Response to Responses
WDFW – KAREN KLOEMPKEN	1	AQU 10-1 para 1	Table 4.10-1.	This section is discussing radio tagged coho and Table 4.10-1 is referred to having “summarized tagging data.” But the table has “Fish tank and receiving water temperatures for 10/26/00 and 10/31/00 release dates.” The table doesn’t match the description. Should the notation be for Table 4.10-2?	This will be clarified in the final report.	
WDFW – JIM BYRNE	1	AQU 10-2	Additional coho release.	The reason for the additional 2,000 adult coho not being released into the upper Swift Reservoir was not the responsibility of WDFW employees, but the licensees for lack of funding.	This study plan originated with WDFW’s plan to release 2000 coho upstream, where it was decided to radio-tag a portion of those fish to track movements. Since this was in WDFW’s plan, it was assumed they had set aside the funding for the transportation. A request did not come to the Utilities to fund transportation, so to say lack of funding from the Utilities was the reason for the change in release plans is inaccurate. Subsequent fish transportation costs were covered by the Utilities.	I must be too sensitive. Why were the 2K fish mentioned at all, since planting did not occur? Why was WDFW singled out for blame? Why was WDFW expected to pay for transport, after PacifiCorp paid for radio tags, and flight time? Let’s drop the offending paragraph. Licensees’ Response: <i>Despite the fact that the 2000 fish were not distributed, the licensees feel that nutrient distribution had no real bearing on the success of other aspects of this study.</i>
WDFW – JIM BYRNE	1	AQU 10-7	Spawning preferences.	There is insufficient evidence that the Muddy River is the preferred spawning location for coho. Only half (15) of the females were placed	If one looks at the behavior of coho through the study, it is clear with the information obtained from the study that	In phase 2 (2001) progeny of adult spawners planted at Swift Forest boat ramp were found in all tributaries of Swift Reservoir

Commenter	Volume	Page/ Paragraph	Statement	Comment	Response	Response to Responses
				<p>in the Muddy R, and four moved out. There was only 3 or 4 redds seen in the Muddy R., which was 10-13% of the females. There was the possibility of one redd being double counted or one female could have dug multiple redds. If coho spawning were to occur in the Muddy River system Smith, Bean and Clearwater Creeks would be better coho habitat.</p> <p>It states that bull trout have not been observed in the Muddy R. but that presents the question of when was the Muddy R. surveyed for bull trout.</p>	<p>coho, without question, PREFERRED the Muddy River. This does not mean that all the time, every year, coho will only run into the Muddy, but the 30 fish studied preferred the Muddy for this study period. Some fish left the Muddy, but returned after a few days! It is premature to assume that Smith, Bean or Clearwater are preferred over the mainstem Muddy. Severe habitat degradation has occurred since the 1956 surveys.</p> <p>Bull trout would not use the Muddy due to temperature constraints – it is too warm and likely lethal in the summer months.</p>	<p>and in the upper Lewis. Notably, they were not found in the mainstem Muddy, but in tributaries of the Muddy. The lack of effort to track adult migration allows confusion.</p> <p>Granted the Muddy is too warm for bull trout. It states bull trout have not been observed in the Muddy. When was the Muddy specifically sampled for bull trout.</p> <p>Licensees’ Response: <i>Sampling occurred in 1988 and 1989 in collaboration with WDFW to determine bull trout distribution in the Muddy River.</i></p>
J. Sampson, Technical Advisor to the Conservation Groups	1	AQU 10-10	“4.10.6 Discussion”	If there was any uncertainty in the number of redds counted and reported for this study (i.e., because of weather or incomplete redd surveys) it should be described here.	A paragraph on the relevance and limitation of redd detections will be added to this section.	
WDFW – JIM BYRNE	1	AQU 10-10	Study completeness.	No reference to 7,000 adult coho planted the following fall and the absence of tracking of these individuals.	AQU 13 Objective 2 and Schedule entry 5 address the fall 2001 plant of adult salmon. The river was near flood stage or highly turbid during most of the spawning season. Snowfall	I do not see this reflected in AQU 13. Alternate sampling methodologies were discussed at length by the ARG yet not utilized. The late December timeframe was too late. Redd construction was missed.

Commenter	Volume	Page/ Paragraph	Statement	Comment	Response	Response to Responses
					was 167% of normal. The survey was conducted during a 4 day window in December. The water remained very turbid during this survey.	Licensees' Response: <i>The original schedule that is referenced is in the Study Plan Document. The final report will fully describe the results.</i>
WDFW – KAREN KLOEMPKEN	1	AQU 10- 10 para 2, second sentence	Sentence correction.	Need a space between “fish” and “identified.”	This change will be made.	

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Figure 4.10-2

**Initial Radio Tracking
Results of First
Release of Coho:**

October 30, 2000

Survey Type:	Foot
Surveyors:	Erik Lesko
Sites Visited:	Eagle Cliff, Muddy River Bridge Area, Swift Boat Ramp
No. of Redds Observed:	0
No. of Fish	16/21 (76%)

- Muddy River Bridge Release
- Eagle Cliff Release

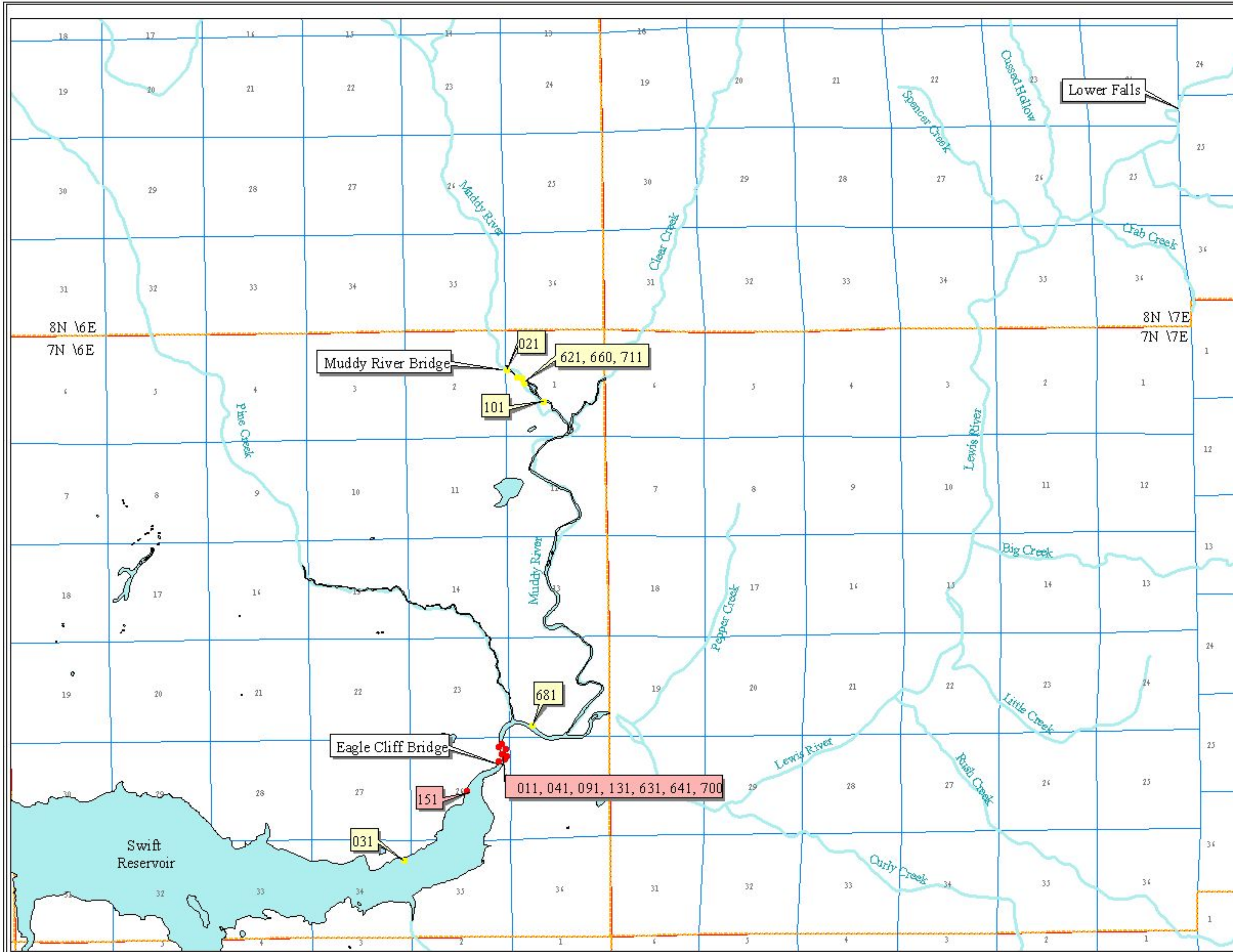
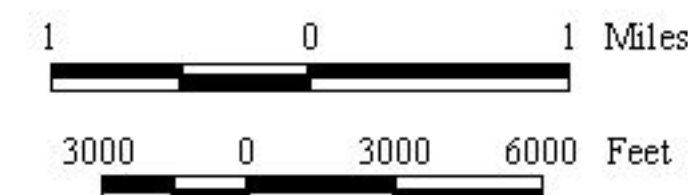
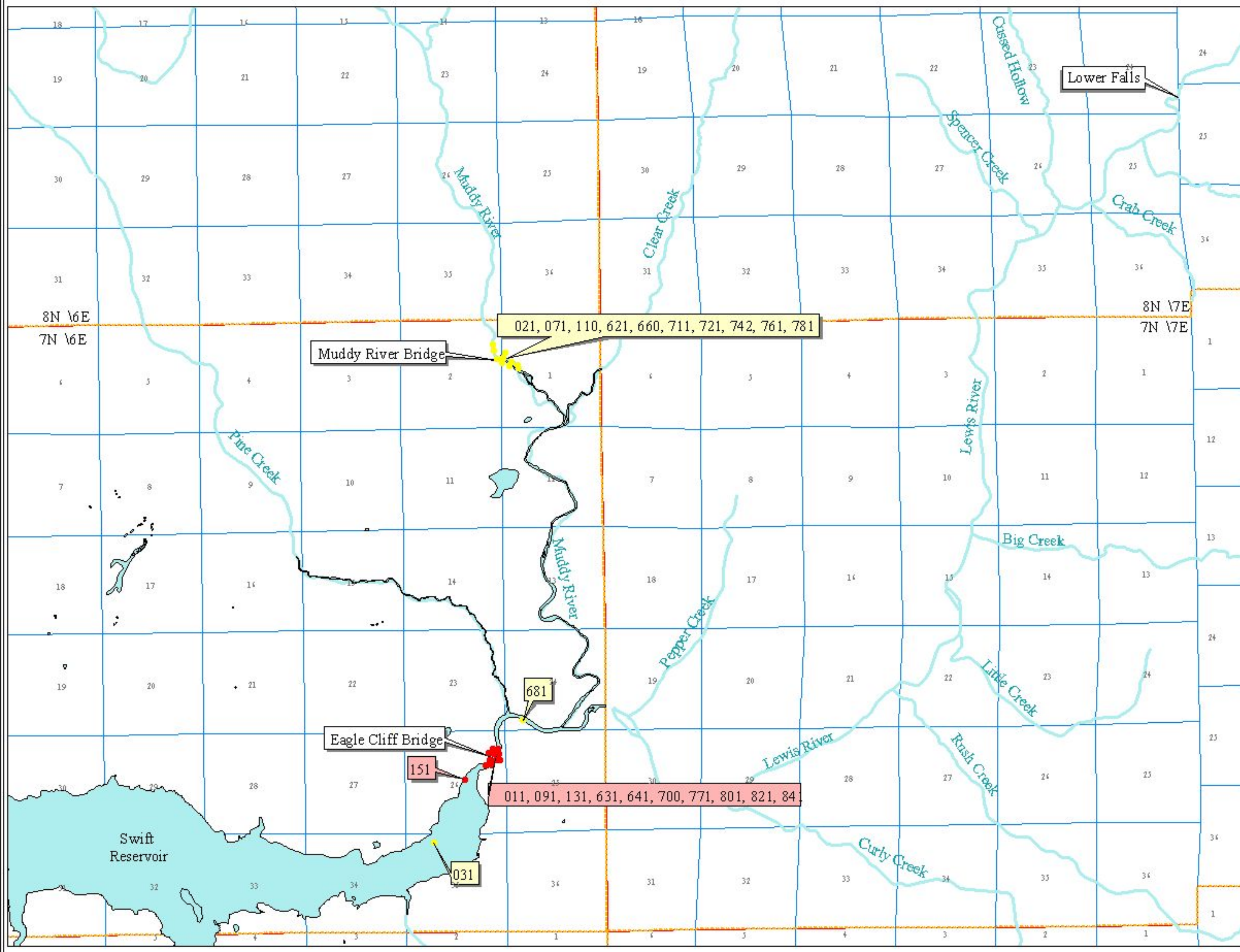




Figure 4.10-3

**Radio Tracking
Results of Initial
and Secondary
Release of Coho:**

October 31, 2000

Survey Type:	Foot
Surveyors:	Erik Lesko
Sites Visited:	Eagle Cliff, Muddy River Bridge Area, Curly Creek Bridge, Pine Creek Mouth, Upper Swift Reservoir
No. of Redds Observed:	0
No. of Fish	23/30 (77%)



-  Muddy River Bridge Release
-  Eagle Cliff Release

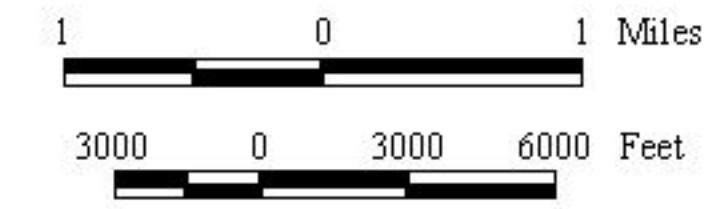
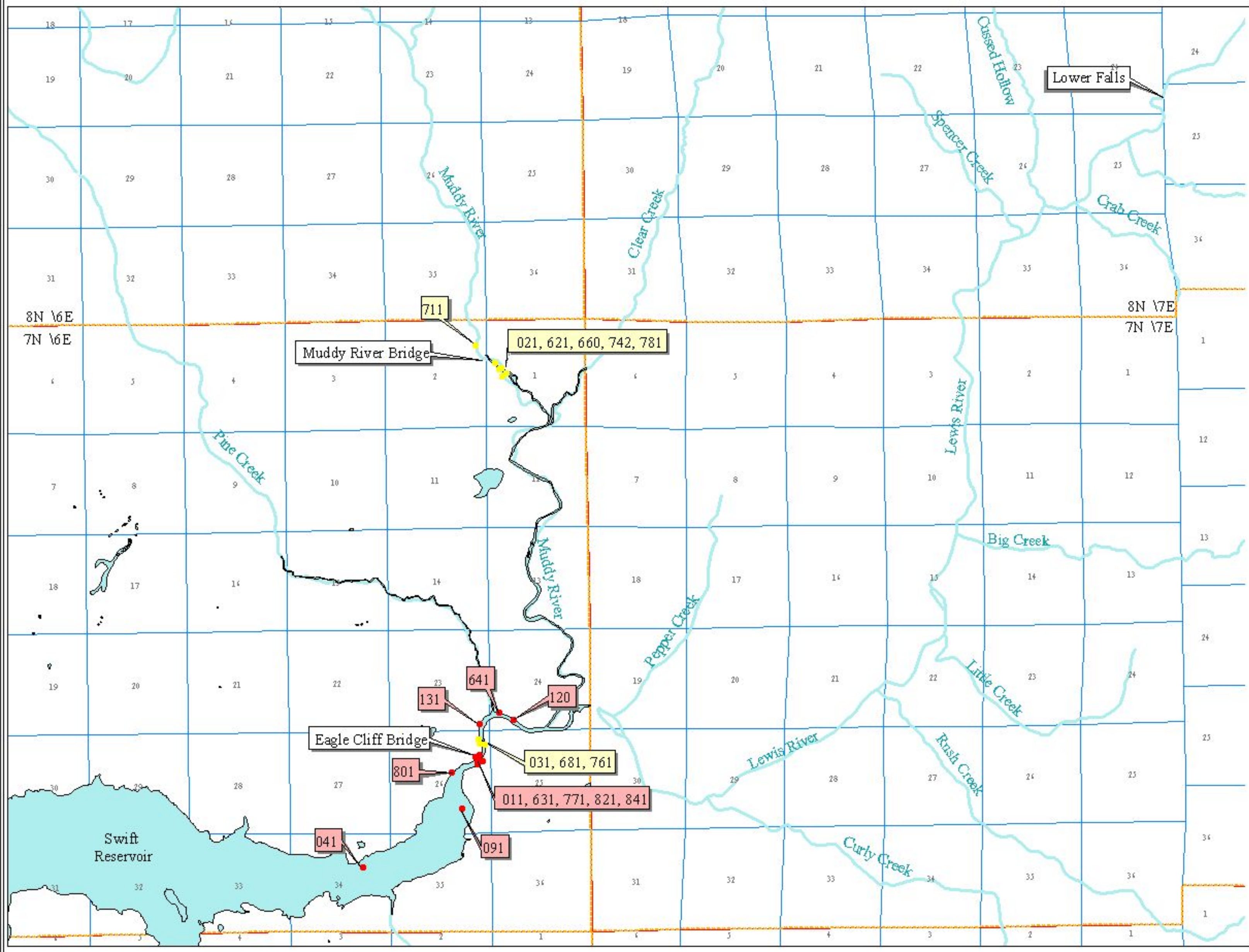


Figure 4.10-4

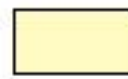
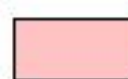
**Radio Tracking
Survey Results:**

November 7, 2000



Survey Type: Foot
 Surveyors: Erik Lesko, Dave Leonhardt
 Sites Visited: Eagle Cliff, Muddy River Bridge Area, Pine Creek Mouth, Upper Swift Reservoir, Swift Boat Ramp, Lewis River (Curly Creek falls to Curly Creek bridge)

No. of Redds Observed: 0
 No. of Fish: 24/30 (80%)

 Muddy River Bridge Release
 Eagle Cliff Release

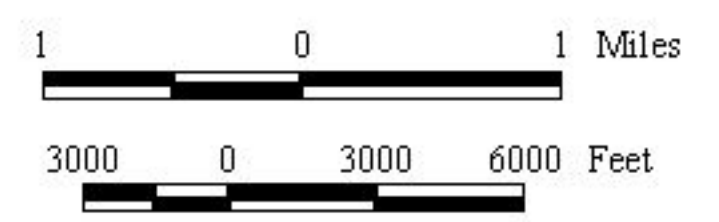


Figure 4.10-5

**Radio Tracking
Survey Result:**

November 14, 2000

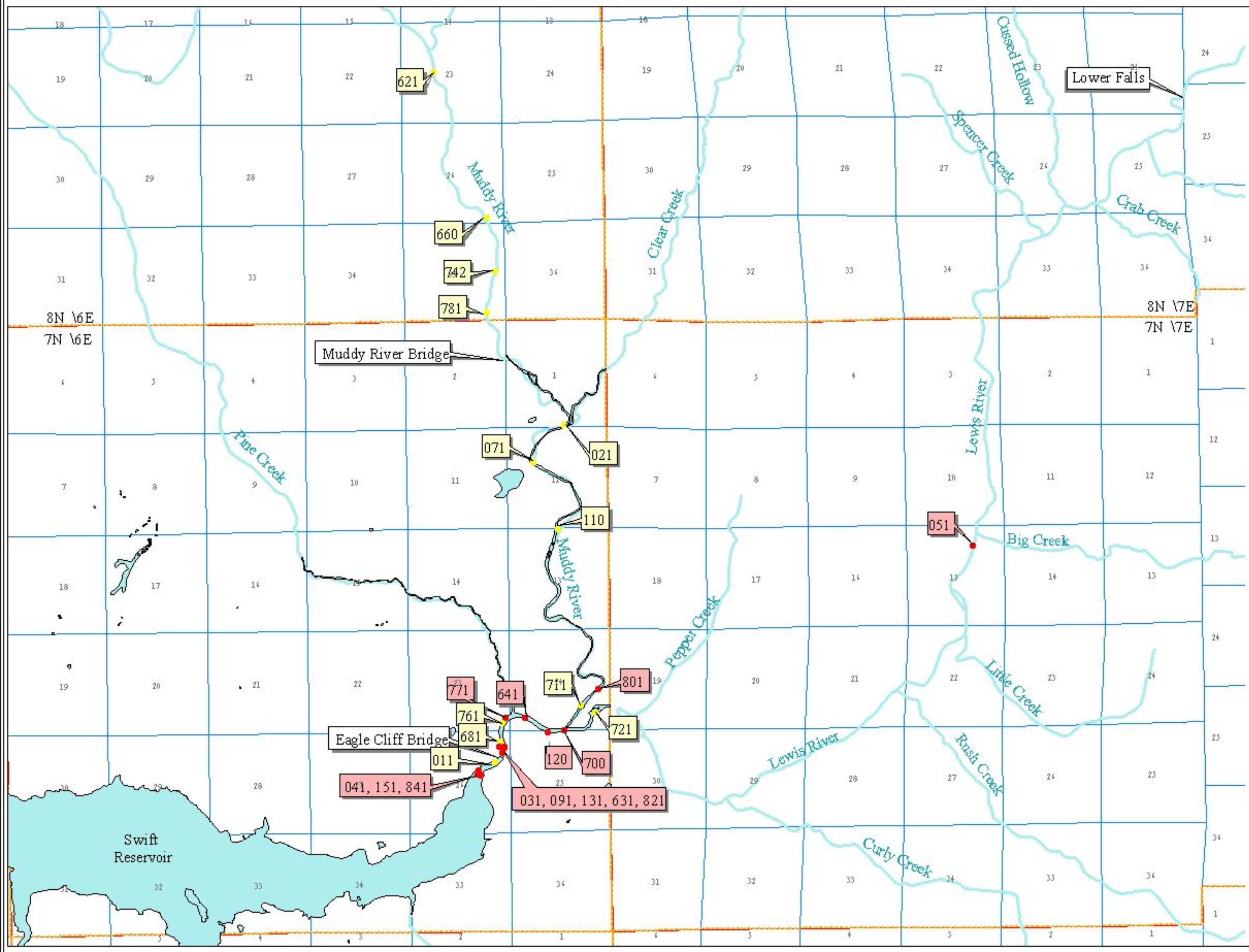
Survey Type: Aerial

Surveyors: Erik Lesko

Sites Visited: Muddy River, Bridge Area, Pine
Creek Mouth, Swift Reservoir,
Lewis River (Swift Reservoir -
Lower Falls)

No. of Redds
Observed: 0

No. of Fish 26/30 (87%)



- Muddy River Bridge Release
- Eagle Cliff Release

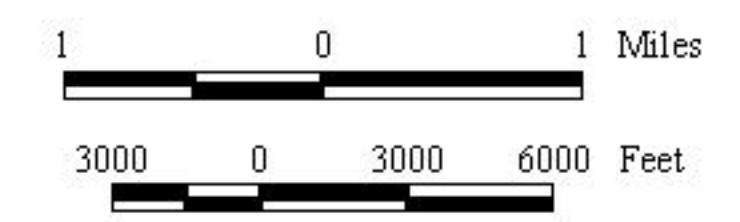
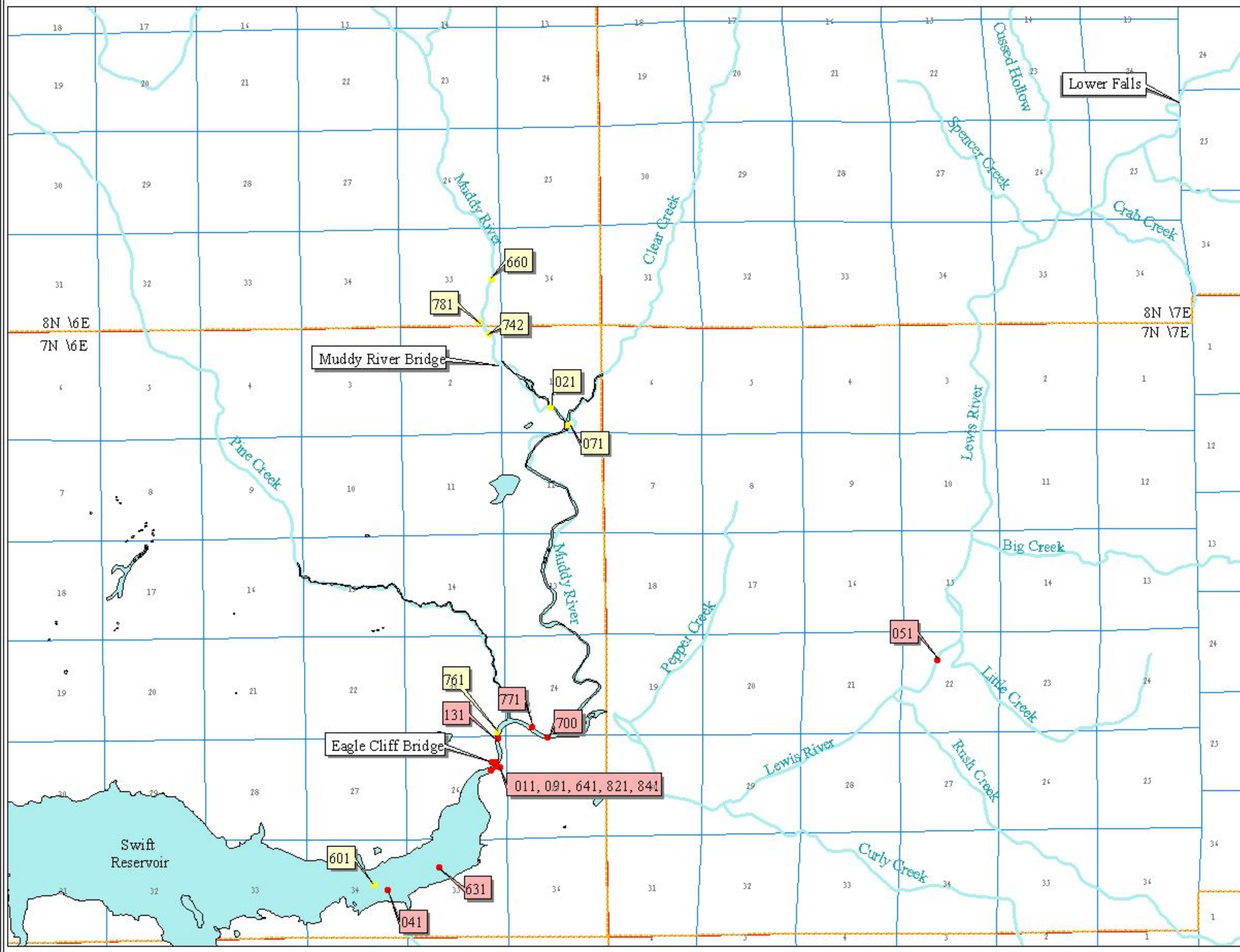


Figure 4.10-6

**Radio Tracking
Survey Result:**

November 22, 2000



Survey Type:	Foot, Bike
Surveyors:	Erik Lesko, Jennifer Kelly
Sites Visited:	Muddy River Bridge, Swift Boat Ramp, Upper Swift Reservoir, Eagle Cliff, Lewis River (Curly Creek falls to Big Creek)
No. of Redds Observed:	0
No. of Fish	18/30 (60%)

- Muddy River Bridge Release
- Eagle Cliff Release

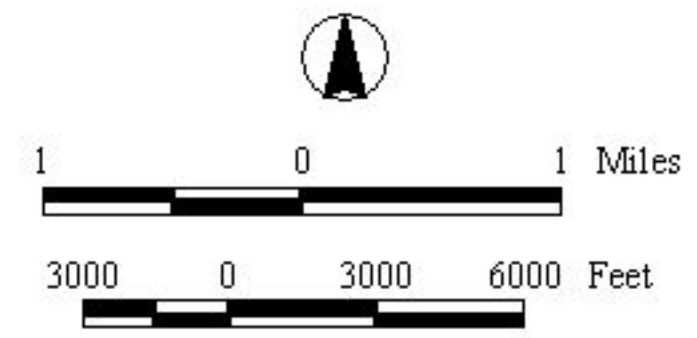
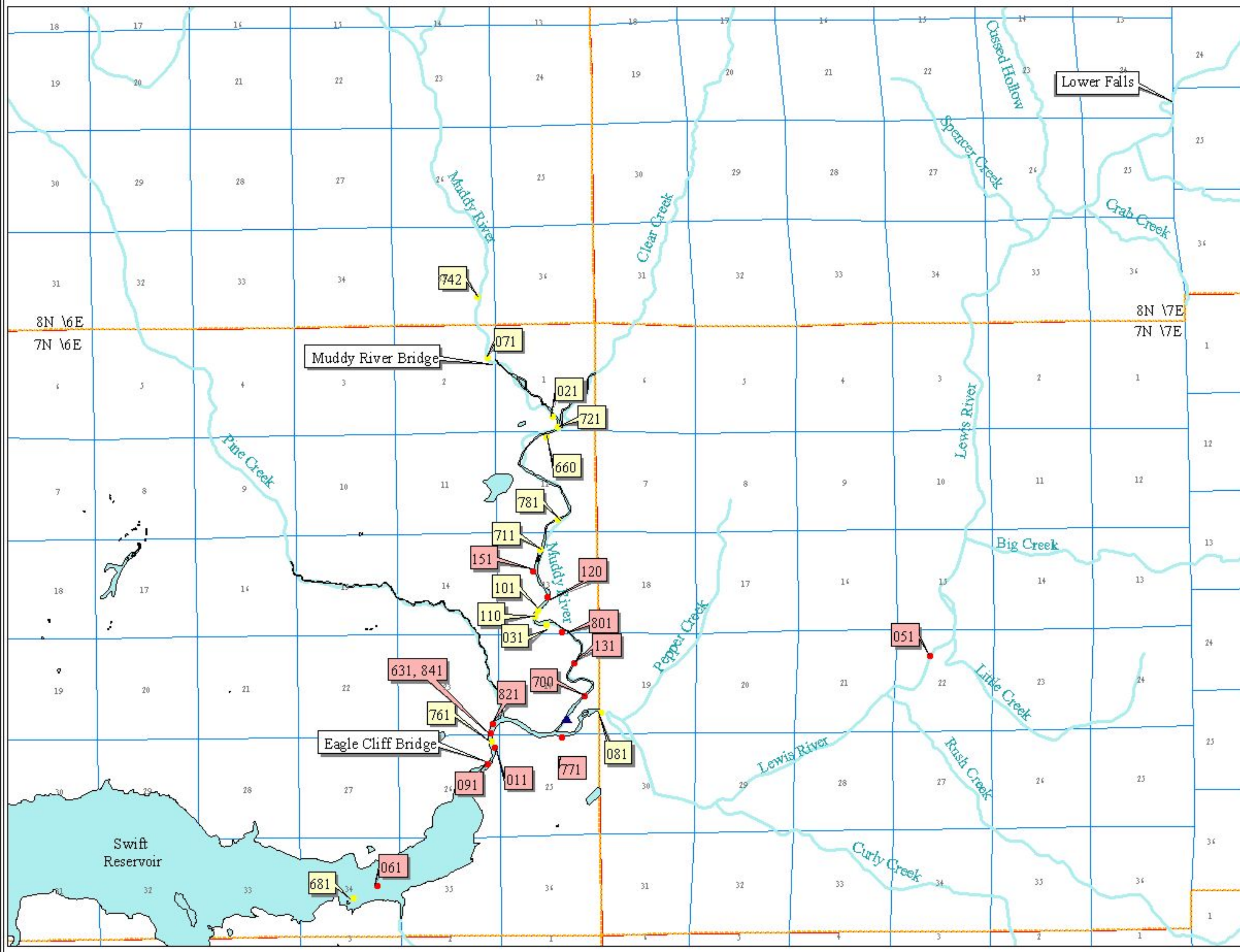


Figure 4.10-7

**Radio Tracking
Survey Result:**

November 28, 2000



Survey Type:	Ariel
Surveyors:	Erik Lesko, Brian Barr
Sites Visited:	Swift Reservoir, Lewis River (Swift Reservoir-Lower Falls), Muddy River, Pine Creek
No. of Redds Observed:	1 (lower Muddy River)
No. of Fish	27/30 (90%)

-  Redd
-  Muddy River Bridge Release
-  Eagle Cliff Release

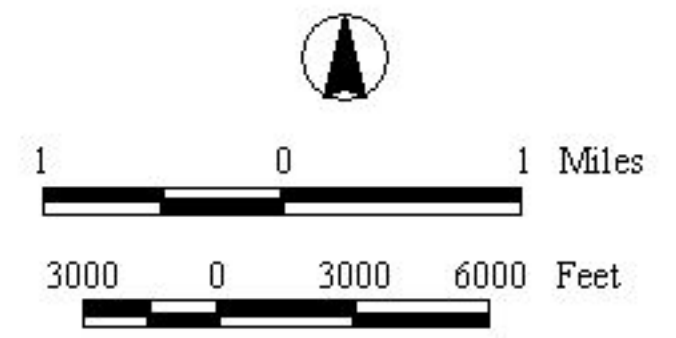


Figure 4.10-8

**Radio Tracking
Survey Result:**

December 4, 2000

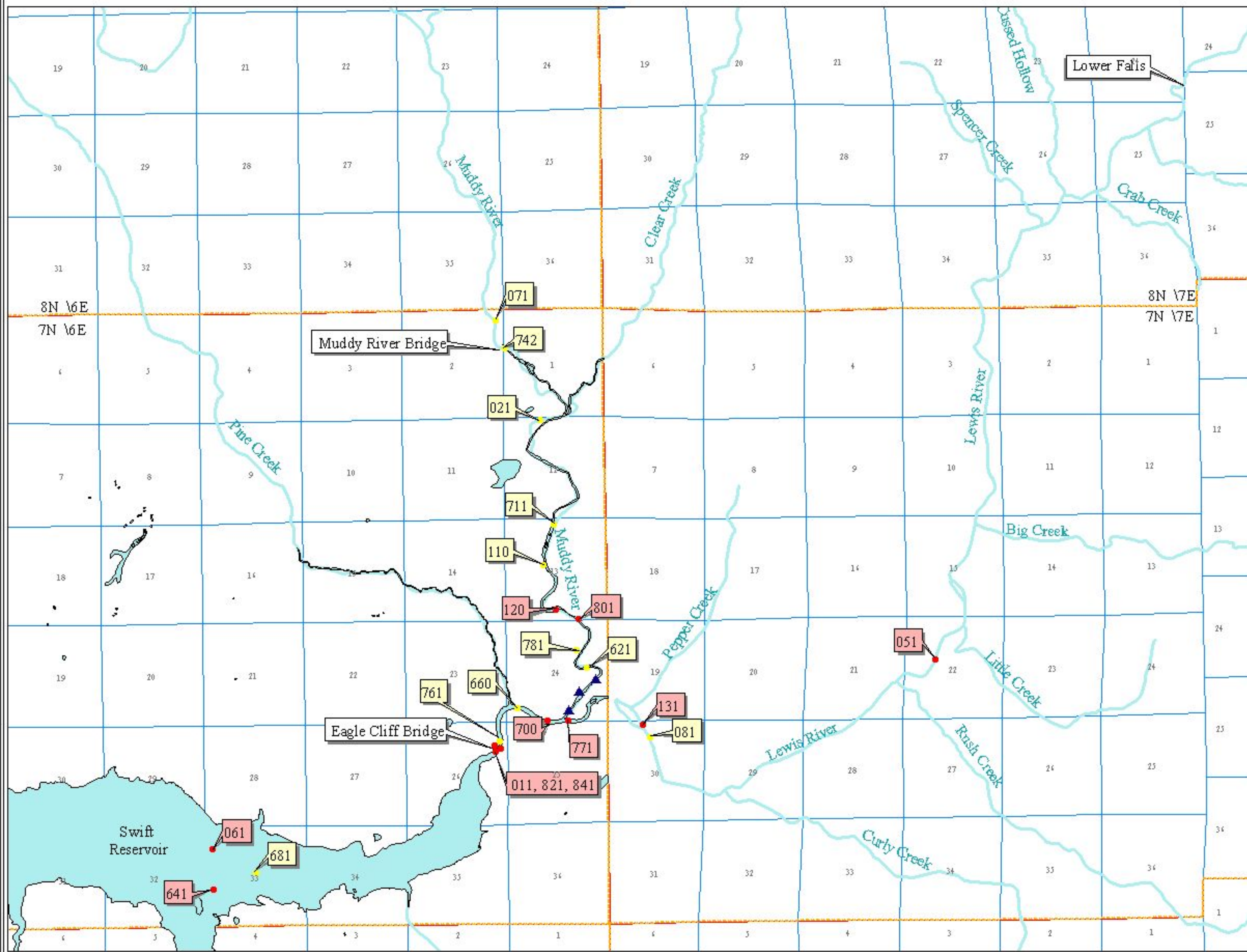
Survey Type: Ariel

Surveyors: Erik Lesko,
Frank Shrier

Sites Visited: Muddy River, Swift Reservoir,
Lewis River (Swift Reservoir-Big
Creek) Clearwater Creek, Clear
Creek

No. of Redds
Observed: 3 (lower Muddy River)

No. of Fish 22/30 (73%)



- ▲ Redd
- Yellow Box Muddy River Bridge Release
- Red Box Eagle Cliff Release

