

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2022-23 SCOPE OF WORK

PROJECT: 179

Project Title

Operation and maintenance of passive interrogation arrays in the Upper Colorado River Basin

Bureau of Reclamation Agreement Number:

n/a

Reclamation Agreement Term

n/a

Note: Recovery Program FY22-23 scopes of work are drafted in May 2021. They often are revised before final Program approval and may subsequently be revised again in response to changing Program needs. Program participants also recognize the need and allow for some flexibility in scopes of work to accommodate new information (especially in nonnative fish management projects) and changing hydrological conditions.

Lead Agency:

U.S. Bureau of Reclamation

Principal Investigators:

Dave Speas

Fish Biologist, U.S. Bureau of Reclamation—Upper Colorado Regional Office
445 West Gunnison Ave Suite 221, Grand Junction, CO 81501
dspeas@usbr.gov

Peter MacKinnon

Fish Detection Engineer, Department of Watershed Sciences Utah State University
pdmackinnon@gmail.com

Travis Francis

Fishery Biologist, U.S. Fish and Wildlife Service
445 West Gunnison Ave. Grand Junction, CO 81501
Travis_Francis@fws.gov

Julie Stahli

Deputy Director, U.S. Fish and Wildlife Service
44 Union Blvd, Lakewood, CO 80228
julie_stahli@fws.gov

Category:

- Ongoing project
- Ongoing-revised project
- Requested new project
- Unsolicited proposal

Expected Funding Source:

- Annual funds
- Capital funds
- Other [explain]

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Relationship to RIPRAP:

General Action Plan:

V.A Measure and document population and habitat parameters to determine status and biological response to recovery actions.

V.A.1.a Develop basinwide razorback monitoring program (implementation to be reflected in sub-basin worksheets).

V.A.1.a.(2) Investigate improving recapture rates through passive PIT tag monitoring, nets, etc. to improve population abundance estimates.

V.A.3. Collect and submit data according to standard protocol (e.g., location, PIT tag #, length, weight, etc.) on endangered fish encountered in all field activities in order to provide annual information on population status outside of formal population estimates.

V.D Establish sampling procedures to minimize adverse impacts to endangered fishes.

V.F Assess relative biological importance of tributaries and their potential contributions to endangered fish recovery.

Green River Action Plan

II. Restore habitat

II.B.2 Screen Tusher Wash diversion to prevent endangered fish entrainment.

II.B.2.b Design.

V. Research and Monitoring

V.A Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.

V.A.2 Identify additional razorback sucker spawning areas in lower Green.

V.C Conduct population estimate for Colorado pikeminnow. Sampling is conducted for 3 years, followed by no sampling for 2 years.

White River Action Plan.

V. Research and Monitoring

V.A Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.

Colorado River Action Plan

II Restore Habitat

II.B.2 Restore fish passage at Price Stubb.

II.B.2.a.(5) Monitor and evaluate success.

V. Research and Monitoring

V.A Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.

Dolores River Action Plan.

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V. Research and Monitoring

V.A Survey native and nonnative fish in Dolores River

Study Background/Rationale and Hypotheses:

Over the last decade, Reclamation and various partners working through the Upper Colorado River Endangered Fish Recovery Program (Recovery Program) have installed a number of passive interrogation arrays (PIAs) throughout the river basin and have also utilized other Passive Integrated Transponder (PIT) tag detection equipment (floating antennas, portable submersible antennas) to explore a variety of questions about endangered fish life history and population dynamics. Passive interrogation arrays function by using stationary antennas which scan the overlaying water column for the presence of fish containing PIT tags. PIT tags are tiny transponder tags implanted into the body cavity of the fish by various fisheries agencies and return a unique alphanumeric code when activated by radio frequency identification (RFID) scanners.

In addition to PIAs and other automated PIT monitoring equipment, the Recovery Program also relies on PIT technology to manually mark individual endangered fish, recapture of which over the years has yielded substantial information on fish growth, movement, population size and survival. Hatchery reared bonytail *Gila elegans* and razorback sucker *Xyrauchen texanus* are injected with PIT tags prior to stocking. Field investigators employ manually operated PIT scanners, chargers, data loggers, PIT tags themselves, and tagging guns or syringes to mark fish of wild origin during various Recovery Program fish sampling projects.

Historically, funding for installation and operation/maintenance (O/M) of Upper Basin PIAs has been largely provided by Reclamation, the Recovery Program and other partners (Utah Division of Wildlife, Colorado Parks and Wildlife) on a mostly opportunistic basis. As a result, O/M of Upper Basin facilities has also been performed on a somewhat opportunistic basis, and there is currently a need for more consistent funding and scheduling of O/M activities to consistently support these systems. Purchase of PIT tags and associated tagging and scanning equipment has historically taken place with Recovery Program funds, but has generally not been an itemized feature of the annual workplan for technical committee review, nor has there been a standardized schedule for determining requirements for a given year.

While PIAs and other equipment, in theory, generate little operation and maintenance costs when compared to those associated with active capture methods (boat- or raft-based mark/recapture surveys), exposure to extreme hydrologic and meteorological conditions in the desert Southwest nevertheless lead to unanticipated and non-trivial costs for repairs and component replacement; in-addition, expected upgrade and replacement costs for electronic and communication equipment is important to consider. Likewise, equipment used in marking and scanning individual fish for presence of PIT tags eventually wears out, breaks or gets lost, making periodic replacement a necessity. PIT tags for tens of thousands of hatchery-reared fish are also required on an annual basis.

Study Goals, Objectives, End Product(s):

Goal: The goals of this scope-of-work (SOW) are 1) to maximize continuity and performance of PIA operations by performing routine annual operation, maintenance, repair, and replacement activities and

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2) provide Recovery Program investigators and hatchery staff with PIT tags and related tagging and scanning equipment for use on an annual basis.

Objectives:

- 1) Conduct routine remote monitoring and troubleshooting of PIA performance
- 2) Conduct site visits as needed to repair equipment, activate, power-up, troubleshoot and tune-up systems, and power down systems for winter months, if applicable.
- 3) Maintain cell and/or satellite connectivity with remote PIAs
- 4) Upgrade existing communication systems to allow more efficient downloads and possible cost savings.
- 5) Work with STReAMS database managers to ensure efficient downloading of data and to ensure all metadata is accurate and up to date.
- 6) Identify PIT tag and related equipment needs; procure and distribute those supplies and equipment as needed.

End Products:

- 1) Operational PIAs with minimal down-time thanks to routine preventative maintenance and repairs.
- 2) Notification to Recovery Program on needed repairs in a timely fashion.
- 3) Upgraded PIA communication systems (as needed).
- 4) Annual reports on a) PIA operation and maintenance activities; and b) weekly summarization of detection data from PIAs
- 5) Adequate stores of PIT tags and related tagging and scanning equipment for use by hatchery and field staff throughout the year.

PIA operation and maintenance

Most PIAs currently in operation in the Upper Basin consist of the following components: 1) PIT-detecting antennas (either pass-through or pass-by types) affixed to streambeds or fish infrastructure such as passages and screens; 2) master controllers or multiplexers which actuate PIT transceivers housed within the antenna panels; 3) data loggers and communications with remote computers facilitated by cell or satellite modems; and 4) a power source which is most commonly battery banks kept charged by solar panels or in some cases AC line voltage. These facilities are often located in remote areas and may require significant effort to access on occasion.

Additionally, all PIAs currently have subscriptions to BioLogic®, which is a web interface service provided by Biomark which affords a range of services directly to end users (i.e., STReAMS need not be consulted to view information directly). End users interested in specific BioLogic®-monitored PIAs can monitor system diagnostics and receive system performance reports, receive reports of tagged fish and specific tag numbers, download data directly, and add upgrades as they become available which will increase data retrieval capabilities.

The following facilities currently operate in the Upper Colorado River Basin and will require operation and maintenance support in the coming years:

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- 1) Colorado River: Price-Stubbs Diversion Dam fish passage. This facility consists of a multiplexer running two pass-through antenna subarrays, with two antennas per sub array, on a head gate structure at the top of the Price-Stubbs fish passage located at river mile (RM) 188.3 left (L) on the Colorado River near Palisade, CO. The system has been operational since 2010 and has logged 24,529 PIT detections as of April 28, 2021. The detection system is powered by solar-charged batteries, and data is transmitted via cell modem. The site is equipped with a 4G modem and Biologic® subscription (Biomark) current through Dec 2021.
- 2) Dolores River (Utah): This facility is located at the Rio Mesa Center (aka Entrada Ranch) on the Dolores River about eight miles upstream from the Colorado River in southeastern Utah. The system consists of a master controller running two pass-by antenna subarrays (five 20' antenna panels in each) which span the channel width. It has logged 24,511 PIT detections tags since it became operational in 2013. The detection system is powered by solar charged batteries and data is transmitted via Hughesnet satellite modem. Sat modem and Biologic® subscription (Biomark) is current through Dec 2021.
- 3) Green River:
 1. Green River Canal fish screen. The Green River Canal originates at RM 127.8 R near the town of Green River, Utah. Since 2013, entrainment of PIT-tagged fish in the Green River canal was monitored by two pass-through style antenna subarrays, but these were decommissioned when construction on a new fish screen began in November 2018. The new facility is equipped with a master controller running 3 pass-through antenna subarrays (2 antennas each) which monitor PIT-tagged fish entering the fish screen facility, fish which are returned to the Green River and any fish which are able to bypass the screen and enter the canal. The detection system is powered through a battery switcher system which is charged by AC power. Data is transmitted by 4G cell modem. Biologic® subscription (Biomark) is current through Dec 2024. The canal PIA (both current and previous configurations) has logged 149,820 PIT detections since monitoring began in 2013.
 2. Tusher Wash Diversion dam and fish passages. The Tusher Wash Diversion is located about a quarter mile upstream from the Green River Canal head gates and was renovated in 2016 to include fish and boat passages. PIAs were installed and became operational in May 2016 and consists of a master controller and several pass-by and pass-through antennas affixed to various features of the diversion dam that would likely to be used by fish (downstream passage notches, boat passage, fish passage, waterwheel structure). To date, antennas on this facility have collectively logged 144,220 PIT detections since it was constructed. The detection system is powered by a battery bank driven by AC power and data is transmitted via 4G cell modem. Biologic® subscription (Biomark) current through Dec 2021.
- 4) San Rafael River: The Chaffin Ranch PIA is not far from the confluence of the Green and San Rafael rivers (RM 97.0) in southcentral Utah; a second PIA located near Hatt Ranch (State Highway 24) operated from 2009 through 2016 but no longer exists. The Chaffin Ranch PIA consists of a multiplexer running two pass-by antenna subarrays (two 10' antenna panels each). Two new detection systems were added to the San Rafael in April and August 2020. An array was added at the Cottonwood Wash site and consists of 4 X 20' antennas. A second array was added at the original Hatts Ranch site and consists of 4 X 20' antennas. These two new sites are

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also powered by solar charged batteries and data is transmitted via Hughesnet satellite modems. Biologic® subscriptions (Biomark) current through Dec 2021. Collectively, antenna arrays in the San Rafael River have logged 22,931 detections since about 2009.

- 5) Price River: Three PIAs currently operate on the Price River in southcentral Utah, one about a mile upstream from the Green River (RM 138.1), one near Woodside and one near Wellington. The confluence and Woodside PIAs have detected a total of 464 individual PIT tags since 2011; both facilities were damaged beyond repair by flash floods in 2016 but were replaced in 2018. The Mounds PIA was also installed in 2018. The new confluence system consists of a master controller running 2 sub-arrays (two 10' antenna panels each). The detection system is powered by solar charged batteries and data is transmitted via Hughes Net satellite modem. The new Woodside system consists of a master controller running 2 sub-arrays (one 20' antenna panel each). The detection system is powered by solar charged batteries and data is transmitted via cell modem. The Mounds system consists of a master controller running 2 sub-arrays (two 15' antenna panels each). The detection system is powered by solar charged batteries and data is transmitted via cell modem; all PIAs in the Price River currently have BioLogic® subscriptions. Biologic subscription (Biomark) current through Dec 2021. In aggregate, Price River PIAs have logged 420,929 detections to date.
- 6) White River at Bonanza Bridge: This system is located just downstream of the Bonanza Bridge over the White River (State Highway 45) in northeastern Utah. It consists of a multiplexer running a single antenna sub-array comprised of six, 20' antenna panels. The Bonanza Bridge PIA has detected 6,207 individual tags since 2012. The detection system is powered by solar charged batteries. Data is transmitted via Hughesnet satellite modem. Biologic® subscription (Biomark) current through Dec 2021. The Bonanza Bridge PIA has logged 78,683 detections to date.

Additionally, numerous portable submersible PIT scanners (“submersibles” or “wagon wheels”) are deployed during the spring-fall sampling season at a range of river locations. These units and/or their power sources and download equipment may also periodically require maintenance, although site visits are likely not necessary for this. Submersibles have been employed to identify sites of spawning activities, collect additional resight data to improve population and survival estimates, monitor fish use of tributaries, and other monitoring purposes in discrete areas. Examples of submersible deployment include monitoring of Colorado pikeminnow spawning movements in Yampa Canyon, use of Vermillion Creek (CO) by Colorado pikeminnow, Colorado pikeminnow spawning below Split Mountain (UT), humpback chub population estimates (Black Rocks, Westwater, Desolation/Gray canyons), razorback sucker spawning near Jensen UT, and other locations.

PIT tags and related tagging and scanning equipment

PIT tags and equipment are utilized for marking and identifying individual hatchery-reared fish (mostly bonytail and razorback sucker at present, plus broodstock of humpback chub *Gila cypha* and Colorado pikeminnow *Ptychocheilus lucius*) as well as wild specimens captured during field investigations. Fish

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hatcheries which supply propagated endangered fish for stocking according to Recovery Program stocking plans include:

Ouray National Fish Hatchery, U.S. Fish and Wildlife Service (USFWS): Grand Valley Unit (Grand Junction, CO) and Randlett Unit (Ouray National Wildlife Refuge, Ouray, UT).

Wahweap State Fish Hatchery, Utah Division of Wildlife Resources (UDWR), Wahweap, UT.

J. W. Mumma Native Aquatic Species Restoration Facility, Colorado Division of Parks and Wildlife (CPW), Alamosa, CO.

In most cases, field investigators are directed to implant all captured endangered fish individuals with PIT tags, regardless of the objective of the field investigation which include mostly mechanical removal of non-native fish and abundance estimates of endangered fish. These investigations take place throughout the Upper Colorado River Basin, including large portions of the Colorado, Gunnison, Dolores, Green, White, and Yampa rivers. Submersible antennas are also typically deployed and retrieved at ca. two-week intervals during abundance estimation or surveys of spawning activity throughout the Upper Colorado River Basin.

Study Methods/Approach:

PIA Operation and maintenance:

Between weekly updates from STReAMS as well as monitoring by principle investigators, stationary PIAs will be contacted about once per week to check settings, download data, and perform diagnostics of the systems. Sometimes problems arise that cannot be solved remotely, in which cases a site visit must be conducted by a technician to assess and repair the system. Once a site visit is deemed necessary, principle investigators (including project leaders, if appropriate) will meet by phone to develop a response plan. Promptness of site visits will vary with accessibility of sites which is often governed by seasonal factors (snow, ice, precipitation), physical attributes of the problem (e.g., submerged antenna loops vs. streamside equipment), weather events, streamflow levels, and occasionally facility or land ownership. If more than one site requires attention at the same time, sites which are integral to high-priority research and monitoring activities will be dealt with first. Typical problems which have arisen in the past include drainage of batteries due to lack of sun, inadequate solar panel output or age of batteries, antenna panels are washed away or damaged by ice, wires are cut, excessive ambient noise, data downloading is disrupted or intermittent, and vandalism/theft.

For the purposes of this SOW, equipment and components for PIA O/M was selected to cover the most common repairs associated with these incidents and includes replacement costs of two, 20' antenna sections per year plus equipment to operate them. Funds will not be obligated to purchase of this equipment until it is determined that repairs or replacement are required. Much like O/M requirements for infrastructure such as fish passages and screens, a **placeholder** for repair and replacement costs should be included Recovery Program annual budgets. Equipment used by field investigators (such as scanners and tagging guns) should be treated in a similar manner, as required quantities will vary from year to year. Recommended **placeholder amounts** are shown at the bottom of the budget table (see Excel spreadsheet for more detail), although these funds will not be expended unless required. **Foreseeable costs** or the amount most likely to be spent in any given year (regardless of repair and field

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equipment costs, which vary) include labor and travel for PIA maintenance, communication charges, and PIT tags.

If antenna system repair/replacement or other equipment are not needed, the funding will be used to purchase additional PIT tags, other PIT equipment or supplies, or other purposes determined with input from the Program Director's Office. Availability of unspent PIA O/M funds will be determined no later than July-August of each year and steps will be taken to obligate those funds if appropriate.

It was discovered in April 2021 two of the ten antenna panels at the White River PIA at Bonanza Bridge are not functioning and may need to be replaced in FY22. Alternatively, the entire array should be considered for an upgrade to the master controller configuration as opposed to the existing (obsolete) multiplexing system. A cost estimate for both alternatives is currently being developed for consideration. In the FY22 budget, the cost for replacement of two 20' stout antenna panels has been included in the event that replacement is the preferred option (cost estimates of system upgrade are currently being developed).

We will work to ensure that efficient and consistent data downloading occurs, which involves occasional troubleshooting and coordination between the database and PIT technical personnel on the ground. Data coming out of automated systems should be formatted consistently to allow for easy upload by STReaMS.

While submersibles generally require the least amount of maintenance of all existing systems, some upkeep may be necessary on occasion. Currently some submersible users are maintaining their equipment using their own financial resources. Lithium-ion batteries can no longer be shipped via UPS or Fedex, so we will coordinate transportation of this equipment for repairs if necessary.

PIT tags and related tagging and scanning equipment

Currently, all PIT tags and related equipment are shipped from the manufacturer to the USFWS Fish and Wildlife Conservation Office (FWCO) in Grand Junction, CO where they are inventoried, stored and distributed to end users according to hatchery fish tagging schedules or on request by field offices on an "as-needed" basis. To determine the latter, field offices will coordinate with the USFWS FWCO (Travis Francis) and Reclamation (Dave Speas) prior to the coming field season with enough lead time to place orders and receive and distribute supplies and equipment (i.e., January-February of each year). During this same time frame, equipment for repairs or replacements will also be purchased if requirements have been determined. In most cases, Reclamation will coordinate purchases.

PIT Tags are usually 12.5 mm, glass encapsulated 134.2 kHz PIT tags which are available both in pre-loaded injection needles and as loose tags without needles. There are currently about 28,000 loose tags in our inventory, so we do not propose buying loose tags for the foreseeable future. PIT tag lot numbers (usually 100 tags per lot, either in trays or loose), their individual PIT tag numbers and their recipients will be entered and tracked in STReaMS

Annual PIT tag requirements for hatcheries are estimated as follows (all tags are pre-loaded in needles, 100 per tray, unless otherwise noted):

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Ouray NFH Grand Valley Unit (24 Road; USFWS): 20,000/year.
ONFH Randlett Unit (USFWS): 20,000/year
Wahweap State Fish Hatchery (UDWR): 10,000/year
Mumma Native Aquatic Species Restoration Facility (CPW): 6,000/year

Field investigators (CPW, UDWR, CSU) in aggregate typically require 4,000 tags in needles/trays per year, and we recommend purchase of an additional 5,000 tags/trays for unforeseen needs. We currently estimate that we have an adequate number of PIT tags in our inventory to satisfy hatchery and field requirements for FY22, so no funds will be required for tags that year.

Scanners are usually available in two configurations, one consisting of a handheld scanning and data logging device with a circular “tennis racket” antenna (Biomark HPR) attached to the scanner with a flexible chord, and the other is a one-piece scanner/antenna “stick reader”. Data logging software is either developed by individual investigators or procured from the manufacturer. Scanners are powered by rechargeable lithium ion batteries and 120VAC chargers are typically included along with a water- and shockproof carrying case. The Biomark HPR Lite is a newer model which has most features of the regular HPR but is more streamlined and may also feature enhanced capabilities to detect older 400 kHz tags.

The FWCO warehouse in Grand Junction currently has on hand 11 Biomark HPR scanners for hatchery or field usage, as well as seven HPR ‘lite’ scanners. About six wagon wheel antennas are currently available for use where needed. No equipment other than tagging guns are scheduled for purchase in FY22. In summary, while we currently have significant numbers of PIT tags and scanners in our inventory, in FY23 and beyond we estimate annual equipment needs for a given year to consist of:

Tags:

65,000 PIT tags in needles/trays

Equipment:

25 gun-style PIT tag implanters
5 HPR scanners or 5 HPR lite scanners
4 wagon wheels with two batteries each
1 wagon wheel battery charger
2 PIT tag tray holders for hatchery use

We emphasize that **quantities of equipment are estimates only** and are meant to approximate needs for an average year. While quantities of PIT tags are relatively certain for a given year, quantities of equipment and other supplies will vary according to discussions with field crews which will take place early in January of each calendar year.

In the budget tables, we have included pricing and quantities for the latest generation IS1001 submersibles which feature an extended read range (about 26’), virtual test tag, diagnostics, noise reports, and extended battery life (40 days). These units cost about twice as much as the RM310 submersible models, which are operated by RM310 readers and feature 12’ read ranges and a 21-day battery life. Support/repair/ and replacement of RM310 submersibles will be available to our Recovery Program for the foreseeable future but will eventually be phased out. The RM310 reader is no longer

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produced. New submersibles can also be powered by a smaller 72Ah battery pack which will bring the cost down slightly and are similar in weight to the original smaller battery packs but only run for 14 days. Also, antennas are usually purchased with two batteries each so that batteries can be swapped out at the end of their expected charge cycle; fewer batteries may be required with the new IS1001 depending on objectives.

Annual reports: We will report to the Recovery Program each year on PIA operation and maintenance.

Task Description, Deliverables and Schedule :

- 1) January: field personnel will coordinate with FWCO and Reclamation to identify equipment needs for the coming field season. Equipment will be ordered and distributed prior to the field season.
- 2) Spring (prior to peak flows): Coordinate with appropriate authorities, landowners etc. on activation of systems which had been dormant for winter months, if applicable. Activate systems and check performance.
- 3) Spring through Fall: Operate and maintain PIAs (remote performance monitoring, physical visit for repair if needed, removal prior to winter)
- 4) Fall through Spring: perform maintenance on PIAs if needed.
- 5) Remote monitoring of PIT tag interrogation sites and data management (year-round)\
- 6) Payment of communications fees (year-round)
- 7) November: Prepare annual report for Recovery Program.

Budget Summary:

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SUMMARY OF PROPOSED COSTS

Name of Servicing Agency:		Utah State University/USBR					
Project Name:		Operation and Maintenance of Upper Colorado River Basin PIA infrastructure.					
Enter the BEGINNING dates for each year ----->		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Enter the ENDING dates for each year ----->		10/1/2021 Through 9/30/2022	10/1/2022 Through 9/30/2023	10/1/2023 Through 9/30/2024	10/1/2024 Through 9/30/2025	10/1/2025 Through 9/30/2026	
DIRECT LABOR AND FRINGE BENEFIT COSTS:		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Direct Labor - Hourly		\$ 25,307.73	\$ 25,307.73	\$ 25,813.88	\$ 26,330.16	\$ 26,856.77	\$ 129,616.27
Fringe Benefits - Hourly		\$ 11,894.63	\$ 11,894.63	\$ 12,132.53	\$ 12,375.18	\$ 12,622.68	\$ 60,919.65
Subtotal of Direct Labor & Fringe Benefits:		\$ 37,202.36	\$ 37,202.36	\$ 37,946.41	\$ 38,705.34	\$ 39,479.45	\$ 190,535.92
OTHER DIRECT COSTS:		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Materials (PIT tags)		\$ -	\$ 123,760.00	\$ 146,523.00	\$ 149,453.46	\$ 152,442.53	\$ 572,178.99
Communications		\$ 25,203.00	\$ 25,707.06	\$ 26,221.22	\$ 26,745.63	\$ 27,280.54	
Travel Costs		\$ 7,274.40	\$ 7,274.40	\$ 7,419.89	\$ 7,568.29	\$ 7,719.65	\$ 37,256.63
Field equipment (scanners, tagging guns, etc)		\$ 40,343.00	\$ 943.50	\$ 981.62	\$ 981.62	\$ 1,001.25	
PIA repair/replacement equip		\$ 40,476.00	\$ 7,776.48	\$ 21,068.10	\$ 21,489.46	\$ 21,919.25	\$ 112,729.29
Contractors		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Subtotal of Other Direct Costs:		\$ 113,296.40	\$ 165,461.44	\$ 202,213.83	\$ 206,238.46	\$ 210,363.22	\$ 897,573.34
INDIRECT/OVERHEAD COSTS:		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Subtotal of Labor and Other Direct Costs:		\$ 150,498.76	\$ 202,663.80	\$ 240,160.24	\$ 244,943.79	\$ 249,842.67	
Total dollars exempt from indirect/overhead base:		\$ 106,022.00	\$ 158,187.04	\$ 194,793.94	\$ 198,670.17	\$ 202,643.57	
<Enter Description of Indirect/OH Cost #1>	****	\$ 7,783.43	\$ 7,783.43	\$ 7,939.10	\$ 8,097.88	\$ 8,259.84	\$ 39,863.70
Total dollars exempt from indirect/overhead base:		\$ -	\$ -	\$ -	\$ -	\$ -	
<Enter Description of Indirect/OH Cost #2>	****	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Subtotal of Indirect/Overhead Costs:		\$ 7,783.43	\$ 7,783.43	\$ 7,939.10	\$ 8,097.88	\$ 8,259.84	\$ 39,863.70
Subtotal:		\$ 158,282.20	\$ 210,447.24	\$ 248,099.34	\$ 253,041.68	\$ 258,102.51	\$ 1,127,972.96
Foreseeable costs (PIA O/M (labor, travel), communications (minimum amt/yr), PIT tags)		\$ 69,679.76	\$ 193,943.82	\$ 218,110.52	\$ 222,472.71	\$ 226,922.17	\$ 931,128.99
Placeholder recommended for equipment (field and repairs)		\$ 80,819.00	\$ 8,719.98	\$ 22,049.72	\$ 22,471.08	\$ 22,920.50	\$ 156,980.28

SUMMARY OF PROPOSED COSTS

Name of Servicing Agency:	Utah State University/USBR
Project Name:	Operation and Maintenance of Upper Colorado River Basin PIA infrastructure.

	Enter the BEGINNING dates for each year ----->		Enter the ENDING dates for each year ----->		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
	10/1/2021	Through	10/1/2022	Through	10/1/2023	10/1/2024	10/1/2025	10/1/2026		
	9/30/2022	9/30/2023	9/30/2024	9/30/2025	9/30/2026					
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Travel Costs					\$ 7,274.40	\$ 7,274.40	\$ 7,419.89	\$ 7,568.29	\$ 7,719.65	\$ 37,256.63
Field equipment (scanners, tagging guns, etc)					\$ 40,343.00	\$ 943.50	\$ 981.62	\$ 981.62	\$ 1,001.25	\$ 43,250.00
PIA repair/replacement equip					\$ 40,476.00	\$ 7,776.48	\$ 21,068.10	\$ 21,489.46	\$ 21,919.25	\$ 112,729.29
Contractors					\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Subtotal of Other Direct Costs:					\$ 113,296.40	\$ 165,461.44	\$ 202,213.83	\$ 206,238.46	\$ 210,363.22	\$ 897,573.34
INDIRECT/OVERHEAD COSTS:					YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Subtotal of Labor and Other Direct Costs:					\$ 150,498.76	\$ 202,663.80	\$ 240,160.24	\$ 244,943.79	\$ 249,842.67	\$ 1,068,069.26
Total dollars exempt from indirect/overhead base:					\$ 106,022.00	\$ 158,187.04	\$ 194,793.94	\$ 198,670.17	\$ 202,643.57	\$ 760,316.72
<Enter Description of Indirect/OH Cost #1>	17.50%		17.50%		\$ 7,783.43	\$ 7,783.43	\$ 7,939.10	\$ 8,097.88	\$ 8,259.84	\$ 39,863.70
Total dollars exempt from indirect/overhead base:					\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<Enter Description of Indirect/OH Cost #2>	0.00%		0.00%		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Subtotal of Indirect/Overhead Costs:					\$ 7,783.43	\$ 7,783.43	\$ 7,939.10	\$ 8,097.88	\$ 8,259.84	\$ 39,863.70

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Subtotal:	\$ 158,282.20	\$ 210,447.24	\$ 248,099.34	\$ 253,041.68	\$ 258,102.51	\$ 1,127,972.96
Foreseeable costs (PIA O/M (labor, travel), communications (minimum amt/yr), PIT tags)	\$ 69,679.76	\$ 193,943.82	\$ 218,110.52	\$ 222,472.71	\$ 226,922.17	\$ 931,128.99
Placeholder recommended for equipment (field and repairs)	\$ 80,819.00	\$ 8,719.98	\$ 22,049.72	\$ 22,471.08	\$ 22,920.50	\$ 156,980.28

SUMMARY OF DIRECT LABOR & FRINGE BENEFITS

Enter Escalation Rates ----->	Yr 2 Escalation Rate	0.00%
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	Task # or Description	Position Title	OPM Pay Location	Current Hourly Rate	YEAR 1					YEAR 2				
					10/1/2021		Through	9/30/2022		10/1/2022		Through	9/30/2023	
					# of Hours	Hourly Rate	Salary Cost	Fringe Rate	Fringe Cost	# of Hours	Hourly Rate	Salary Cost	Fringe Rate	Fringe Cost
1	2,3,5	Utah State University Electronic Engineer/RFID Specialist	Rest of US	\$ 57.22	300.0	\$ 57.22	\$ 17,166.60	47.00%	\$ 8,068.30	300.0	\$ 57.22	\$ 17,166.60	47.00%	\$ 8,068.30
2	2,3,5	Utah State University employee	Rest of US	\$ 36.41	90.0	\$ 36.41	\$ 3,277.26	47.00%	\$ 1,540.31	90.0	\$ 36.41	\$ 3,277.26	47.00%	\$ 1,540.31
4	3	Electrical Engineer	Rest of US	\$ 57.22	85.0	\$ 57.22	\$ 4,863.87	47.00%	\$ 2,286.02	85.0	\$ 57.22	\$ 4,863.87	47.00%	\$ 2,286.02
					475.00		\$ 25,307.73		\$ 11,894.63	475.00		\$ 25,307.73		\$ 11,894.63

SUMMARY OF DIRECT LABOR & FRINGE BENEFITS

Yr 3 Escalation Rate	2.00%
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Yr 4 Escalation Rate	2.00%
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	Task # or Description	Position Title	OPM Pay Location	Current Hourly Rate	YEAR 3					YEAR 4				
					10/1/2023		Through	9/30/2024		10/1/2024		Through	9/30/2025	
					# of Hours	Hourly Rate	Salary Cost	Fringe Rate	Fringe Cost	# of Hours	Hourly Rate	Salary Cost	Fringe Rate	Fringe Cost
1	2,3,5	Utah State University Electronic Engineer/RFID Specialist	Rest of US	\$ 57.22	300.0	\$ 58.37	\$ 17,509.93	47.00%	\$ 8,229.67	300.0	\$ 59.53	\$ 17,860.13	47.00%	\$ 8,394.26
2	2,3,5	Utah State University employee	Rest of US	\$ 36.41	90.0	\$ 37.14	\$ 3,342.81	47.00%	\$ 1,571.12	90.0	\$ 37.89	\$ 3,409.66	47.00%	\$ 1,602.54
4	3	Electrical Engineer	Rest of US	\$ 57.22	85.0	\$ 58.37	\$ 4,961.15	47.00%	\$ 2,331.74	85.0	\$ 59.53	\$ 5,060.37	47.00%	\$ 2,378.37
					475.00		\$ 25,813.88		\$ 12,132.53	475.00		\$ 26,330.16		\$ 12,375.18

SUMMARY OF DIRECT LABOR & FRINGE BENEFITS

Yr 5 Escalation Rate	2.00%
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YEAR 5												
					10/1/2025		Through		9/30/2026			
Task # or Description	Position Title	OPM Pay Location	Current Hourly Rate	# of Hours	Hourly Rate	Salary Cost	Fringe Rate	Fringe Cost	Total Salary Cost	Total Fringe Cost	Total Labor Cost	
1	2,3,5	Utah State University Electronic Engineer/RFID Specialist	Rest of US \$ 57.22	300.0	\$ 60.72	\$ 18,217.33	47.00%	\$ 8,562.15	\$ 87,920.60	\$ 41,322.68	\$ 129,243.28	
2	2,3,5	Utah State University employee	Rest of US \$ 36.41	90.0	\$ 38.64	\$ 3,477.85	47.00%	\$ 1,634.59	\$ 16,784.84	\$ 7,888.88	\$ 24,673.72	
4	3	Electrical Engineer	Rest of US \$ 57.22	85.0	\$ 60.72	\$ 5,161.58	47.00%	\$ 2,425.94	\$ 24,910.84	\$ 11,708.09	\$ 36,618.93	
				475.00		\$ 26,856.77		\$ 12,622.68	\$ 129,616.27	\$ 60,919.65	\$ 190,535.92	

SUMMARY OF MATERIALS AND SUPPLIES

SUMMARY OF MATERIALS, SUPPLIES, AND SERVICES	Yr 2 Escalation Rate	2.00%	Yr 3 Escalation Rate	2.00%
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Note: This selection of equipment represents the more common equipment replacement needs typically encountered within a given year.

	Task # or Description	Item Description	Rationale for Proposed Cost	Year 1			Year 2			Year 3		
				Unit Price	Unit Quantity	Subtotal	Unit Price	Unit Quantity	Subtotal	Unit Price	Unit Quantity	Subtotal
1	1	APT12 PIT tags, pre-loaded in trays	USBR contract 140R4018D0012		0	\$ -	\$2.21	56000	\$ 123,760.00	\$ 2.25	65000	\$ 146,523.00
2						\$ -			\$ -			\$ -
3						\$ -	\$ -		\$ -	\$ -		\$ -
4						\$ -	\$ -		\$ -	\$ -		\$ -
5						\$ -	\$ -		\$ -	\$ -		\$ -
6						\$ -	\$ -		\$ -	\$ -		\$ -
7						\$ -	\$ -		\$ -	\$ -		\$ -
8						\$ -	\$ -		\$ -	\$ -		\$ -
TOTAL:						\$ -			\$ 123,760.00			\$ 146,523.00

SUMMARY OF MATERIALS AND SUPPLIES

SUMMARY OF MATERIALS,SUPPLIES, Svc.	Yr 4 Escalation Rate	2.00%
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Note: This selection of equipment rep typically encountered within a given ye

			Year 4		
	Task # or Description	Item Description	Unit Price	Unit Quantity	Subtotal
1	1	APT12 PIT tags, pre-loaded in trays	\$ 2.30	65000	\$ 149,453.46
2					\$ -
3			\$ -		\$ -
4			\$ -		\$ -
5			\$ -		\$ -
6			\$ -		\$ -
7			\$ -		\$ -
8			\$ -		\$ -
			\$ -		\$ -
					\$ 149,453.46

SUMMARY OF MATERIALS AND SUPPLIES

SUMMARY OF MATERIALS, SUPPLIES, Svc M	Yr 5 Escalation Rate	2.00%
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Note: This selection of equipment rep typically encountered within a given ye

		Year 5				
	Task # or Description	Item Description	Unit Price	Unit Quantity	Subtotal	TOTAL
1	1	APT12 PIT tags, pre-loaded in trays	\$ 2.35	65000	\$ 152,442.53	\$ 572,178.99
2					\$ -	\$ -
3			\$ -		\$ -	\$ -
4			\$ -		\$ -	\$ -
5			\$ -		\$ -	\$ -
6			\$ -		\$ -	\$ -
7			\$ -		\$ -	\$ -
8			\$ -		\$ -	\$ -
			\$ -		\$ -	\$ -
					\$ 152,442.53	\$ 572,178.99

SUMMARY OF TRAVEL COSTS

Note: Travel costs are based on round trips from Logan UT to Grand Junction, CO, which encompasses distances to all Upper Basin PIA facilities. Actual travel costs could be less because some trips can be conducted in conjunction with other projects (i.e., San Juan O/M), and 8 trips/year may not be needed, etc.

Cost of Living: 0 0.02 0.02 0.02

Task 1	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
	1	1	1	1	1	
From-To	Logan UT - Green River UT	Logan UT - Green River UT	Logan UT - Green River UT	Logan UT - Green River UT	Logan UT - Green River UT	
Reason	PIA operation/maintenance	PIA operation/maintenance	PIA operation/maintenance	PIA operation/maintenance	PIA operation/maintenance	
# of Days (include travel days)	3	3	3	3	3	
Airfare						
Lodging (Per Night)	\$ 70.00	\$ 70.00	\$ 71.40	\$ 72.83	\$ 74.28	
MI&E Per Day	\$ 46.00	\$ 46.00	\$ 46.92	\$ 47.86	\$ 48.82	
Auto Rental Per Day						
Misc Costs/Adjustments/Trip						
Total Per Trip	\$ 255.00	\$ 255.00	\$ 260.10	\$ 265.30	\$ 270.61	
No. of persons	2	2	2	2	2	
No. of trips	8	8	8	8	8	
Mileage rate	\$ 0.55	\$ 0.55	\$ 0.56	\$ 0.57	\$ 0.58	
Total miles	726	726	726	726	726	
SUBTOTAL =	\$ 7,274.40	\$ 7,274.40	\$ 7,419.89	\$ 7,568.29	\$ 7,719.65	\$ 37,256.63

SUMMARY OF EQUIPMENT COSTS

SUMMARY OF EQUIPMENT

Yellow=repair/replacement costs
 Orange=supplies/equipment for use by field investigators

Enter Escalation Rates -----> Yr 2 Escalation Rate 2.00% Yr 3 Escalation Rate 2.00%

	Task # or Description	Item Description	Rationale for Proposed Cost	Year 1			Year 2			Year 3		
				Unit Price	Unit Quantity	Subtotal	Unit Price	Unit Quantity	Subtotal	Unit Price	Unit Quantity	Subtotal
1	2	Solar batteries: 260 AH SunXtender	Advanced Power Products	\$ 650.00	8	\$ 5,200.00	\$ 663.00	8	\$ 5,304.00	\$ 676.26	8	\$ 5,410.08
2	2	Solar batteries: 130 AH SunXtender	Advanced Power Products	\$ 350.00	4	\$ 1,400.00	\$ 357.00	4	\$ 1,428.00	\$ 364.14	4	\$ 1,456.56
3	2	IS1001 Reader node	Biomark catalog/Project cost sheet	\$ 1,485.00	4	\$ 5,940.00	\$ 1,514.70	0	\$ -	\$ 1,544.99	2	\$ 3,089.99
4	2	IS1001 Submersible enclosure	Biomark 2021 catalog/Project cost sheet (USU)	\$ 975.00	4	\$ 3,900.00	\$ 994.50	0	\$ -	\$ 1,014.39	2	\$ 2,028.78
5	2	20' Antenna	Biomark 2021 catalog/Project cost sheet (USU)	\$ 2,412.00	4	\$ 9,648.00	\$ 2,460.24	0	\$ -	\$ 2,509.44	2	\$ 5,018.89
6	2	20' stout antenna for multiplexer (White River, 2022 only)	Biomark 2021 catalog/Project cost sheet (USU)	\$ 3,800.00	2	\$ 7,600.00	\$ 3,876.00	0	\$ -	\$ 3,953.52	0	\$ -
7	2	Anchors	Biomark 2021 catalog/Project cost sheet (USU)	\$ 64.00	16	\$ 1,024.00	\$ 65.28	16	\$ 1,044.48	\$ 66.59	16	\$ 1,065.37
8	2	4G Modem Kit	Biomark 2021 catalog/Project cost sheet (USU)	\$ 581.00	4	\$ 2,324.00	\$ 592.62		\$ -	\$ 604.47	2	\$ 1,208.94
9	2	Satellite modem KIT	Biomark 2021 catalog/Project cost sheet (USU)	\$ 1,720.00	2	\$ 3,440.00	\$ 1,754.40		\$ -	\$ 1,789.49	1	\$ 1,789.49
10	1	Gun-style PIT implanter MK25	USBR contract 140R4018D0012	\$ 37.00	25	\$ 925.00	\$ 37.74	25	\$ 943.50	\$ 38.49	25	\$ 962.37
11	1	HPR Plus handheld PIT scanner	USBR contract 140R4018D0012	\$ 2,933.00	2	\$ 5,866.00	\$ 2,991.66		\$ -	\$ 3,051.49	2	\$ 6,102.99
12	1	HPR Lite handheld PIT scanner	USBR contract 140R4018D0012	\$ 812.00	3	\$ 2,436.00	\$ 828.24		\$ -	\$ 844.80	3	\$ 2,534.41
13	1	Submersible, IS1001, 3' antenna only*	Biomark 2021 catalog/Project cost sheet (USU)	\$ 2,111.00	4	\$ 8,444.00	\$ 2,153.22		\$ -	\$ 2,196.28	4	\$ 8,785.14
14		Submersible, IS1001, 5' antenna only*	Biomark 2021 catalog/Project cost sheet (USU)	\$ 1,624.00	0	\$ -	\$ 1,656.48		\$ -	\$ 1,689.61	0	\$ -
15		Submersible, IS1001 LP Node, 1 per antenna	Biomark 2021 catalog/Project cost sheet (USU)	\$ 1,250.00	4	\$ 5,000.00	\$ 1,275.00		\$ -	\$ 1,300.50	4	\$ 5,202.00
16	1	Submersible 180Ah battery* 35 day	Biomark 2021 catalog/Project cost sheet (USU)	\$ 2,700.00	4	\$ 10,800.00	\$ 2,754.00		\$ -	\$ 2,809.08	4	\$ 11,236.32
17		Submersible 72Ah battery* 14 day (can be configured for RM310)	Biomark 2021 catalog/Project cost sheet (USU)	\$ 1,450.00	4	\$ 5,800.00	\$ 1,479.00		\$ -	\$ 1,508.58	4	\$ 6,034.32
18	1	Submersible battery charger 25A	USBR contract 140R4018D0012	\$ 352.00	1	\$ 352.00	\$ 359.04		\$ -	\$ 366.22	1	\$ 366.22
19	1	PIT tag try holder	USBR contract 140R4018D0012	\$ 120.00	6	\$ 720.00	\$ 122.40		\$ -	\$ 124.85	0	\$ -
20				\$ -	0	\$ -	\$ -	0	\$ -	\$ -	0	\$ -
21				\$ -	0	\$ -	\$ -	0	\$ -	\$ -	0	\$ -
22				\$ -	0	\$ -	\$ -	0	\$ -	\$ -	0	\$ -
23				\$ -	0	\$ -	\$ -	0	\$ -	\$ -	0	\$ -
24				\$ -	0	\$ -	\$ -	0	\$ -	\$ -	0	\$ -
25				\$ -	0	\$ -	\$ -	0	\$ -	\$ -	0	\$ -
TOTAL:						\$ 80,819.00			\$ 8,719.98			\$ 62,291.87

Year 1 is probably the most realistic estimate for field equip; not sure beyond

SUMMARY OF EQUIPMENT COSTS

SUMMARY OF EQUIPMENT	Yr 4 Escalation Rate	2.00%	Yr 5 Escalation Rate	2.00%
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Yellow=repair/replacement costs
 Orange=supplies/equipment for use by field investigators

	Task # or Description	Item Description	Year 4			Year 5			TOTAL
			Unit Price	Unit Quantity	Subtotal	Unit Price	Unit Quantity	Subtotal	
1	2	Solar batteries: 260 AH SunXtender	\$ 689.79	8	\$ 5,518.28	\$ 703.58	8	\$ 5,628.65	\$ 27,061.01
2	2	Solar batteries: 130 AH SunXtender	\$ 371.42	4	\$ 1,485.69	\$ 378.85	4	\$ 1,515.41	\$ 7,285.66
3	2	IS1001 Reader node	\$ 1,575.89	2	\$ 3,151.79	\$ 1,607.41	2	\$ 3,214.82	\$ 15,396.60
4	2	IS1001 Submersible enclosure	\$ 1,034.68	2	\$ 2,069.36	\$ 1,055.37	2	\$ 2,110.74	\$ 10,108.88
5	2	20' Antenna	\$ 2,559.63	2	\$ 5,119.27	\$ 2,610.83	2	\$ 5,221.65	\$ 25,007.81
6	2	20' stout antenna for multiplexer (White River, 2022 only)	\$ 4,032.59	0	\$ -	\$ 4,113.24	0	\$ -	\$ 7,600.00
7	2	Anchors	\$ 67.92	16	\$ 1,086.68	\$ 69.28	16	\$ 1,108.41	\$ 5,328.94
8	2	4G Modem Kit	\$ 616.56	2	\$ 1,233.12	\$ 628.89	2	\$ 1,257.79	\$ 6,023.85
9	2	Satellite modem KIT	\$ 1,825.28	1	\$ 1,825.28	\$ 1,861.78	1	\$ 1,861.78	\$ 8,916.55
10	1	Gun-style PIT implanter MK25	\$ 39.26	25	\$ 981.62	\$ 40.05	25	\$ 1,001.25	\$ 4,813.74
11	1	HPR Plus handheld PIT scanner	\$ 3,112.52	0	\$ -	\$ 3,174.77	0	\$ -	\$ 11,968.99
12	1	HPR Lite handheld PIT scanner	\$ 861.70	0	\$ -	\$ 878.93	0	\$ -	\$ 4,970.41
13	1	Submersible, IS1001, 3' antenna only*	\$ 2,240.21	0	\$ -	\$ 2,285.01	0	\$ -	\$ 17,229.14
14		Submersible, IS1001, 5' antenna only*	\$ 1,723.40	0	\$ -	\$ 1,757.87	0	\$ -	
15		Submersible, IS1001 LP Node, 1 per antenna	\$ 1,326.51	0	\$ -	\$ 1,353.04	0	\$ -	
16	1	Submersible 180Ah battery* 35 day	\$ 2,865.26	0	\$ -	\$ 2,922.57	0	\$ -	\$ 22,036.32
17		Submersible 72Ah battery* 14 day (can be configured for RM310)	\$ 1,538.75	0	\$ -	\$ 1,569.53	0	\$ -	
18	1	Submersible battery charger 25A	\$ 373.55	0	\$ -	\$ 381.02	0	\$ -	\$ 718.22
19	1	PIT tag try holder	\$ 127.34	0	\$ -	\$ 129.89	0	\$ -	\$ 720.00
20			\$ -	0	\$ -	\$ -	0	\$ -	\$ -
21			\$ -	0	\$ -	\$ -	0	\$ -	\$ -
22			\$ -	0	\$ -	\$ -	0	\$ -	\$ -
23			\$ -	0	\$ -	\$ -	0	\$ -	\$ -
24			\$ -	0	\$ -	\$ -	0	\$ -	\$ -
25			\$ -	0	\$ -	\$ -	0	\$ -	\$ -
Year 1 is probably the most realistic estimate for field equip; not sure beyond					\$ 22,471.08		\$ 22,920.50	\$ 197,222.43	

SUMMARY OF MATERIALS AND SUPPLIES

Communications (to be paid directly by USBR/

Yr 2 Escalation Rate

2.00%

	Task # or Description	Item Description	Rationale for Proposed Cost	Year 1			Year 2		
				Unit Price	Unit Quantity	Subtotal	Unit Price	Unit Quantity	Subtotal
	4	Cell, Green River Canal Fish Screen Biologic including cell service, one year	Biomark Catalog, annual (12 month) subscription	\$ 1,512.00	1	\$ 1,512.00	\$ 1,542.24	1	\$ 1,542.24
	4	Cell, Green River Tusher Diversion Biologic including cell service, one year	Biomark Catalog, annual (12 month) subscription	\$ 1,512.00	1	\$ 1,512.00	\$ 1,542.24	1	\$ 1,542.24
	4	Cell, Price Stub Biologic including cell service, one year	Biomark Catalog, annual (12 month) subscription	\$ 1,512.00	1	\$ 1,512.00	\$ 1,542.24	1	\$ 1,542.24
	4	Cell, Price River Woodside Biologic including cell service, one year	Biomark Catalog, annual (12 month) subscription	\$ 1,513.00	1	\$ 1,513.00	\$ 1,543.26	1	\$ 1,543.26
		Cell, Price River Mounds Biologic including cell service, one year	Biomark Catalog, annual (12 month) subscription	\$ 1,514.00	1	\$ 1,514.00	\$ 1,544.28	1	\$ 1,544.28
	4	Satellite, Price River Confluence Biologic including satellite service, one year	Biomark Catalog, annual (12 month) subscription	\$ 2,940.00	1	\$ 2,940.00	\$ 2,998.80	1	\$ 2,998.80
	4	Satellite, Dolores Rio Mesa Biologic including satellite service, one year	Biomark Catalog, annual (12 month) subscription	\$ 2,940.00	1	\$ 2,940.00	\$ 2,998.80	1	\$ 2,998.80
	4	Satellite, San Rafael Chaffin Ranch Biologic including satellite service, one year	Biomark Catalog, annual (12 month) subscription	\$ 2,940.00	1	\$ 2,940.00	\$ 2,998.80	1	\$ 2,998.80
	4	Satellite, San Rafael Hatts Ranch Biologic including satellite service, one year	Biomark Catalog, annual (12 month) subscription	\$ 2,940.00	1	\$ 2,940.00	\$ 2,998.80	1	\$ 2,998.80
	4	Satellite, San Rafael Cottonwood Wash Biologic including satellite service, one year	Biomark Catalog, annual (12 month) subscription	\$ 2,940.00	1	\$ 2,940.00	\$ 2,998.80	1	\$ 2,998.80
	4	Satellite, White River Bonanza Bridge Biologic including satellite service, one year	Biomark Catalog, annual (12 month) subscription	\$ 2,940.00	1	\$ 2,940.00	\$ 2,998.80	1	\$ 2,998.80
TOTAL:						\$ 25,203.00			\$ 25,707.06

SUMMARY OF MATERIALS AND SUPPLIES

Communications (to be paid directly by USBR/	Yr 3 Escalation Rate	2.00%	Yr 4 Escalation Rate	2.00%
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	Task # or Description	Item Description	Year 3			Year 4		
			Unit Price	Unit Quantity	Subtotal	Unit Price	Unit Quantity	Subtotal
	4	Cell, Green River Canal Fish Screen Biologic including cell service, one year	\$ 1,573.08	1	\$ 1,573.08	\$ 1,604.55	1	\$ 1,604.55
	4	Cell, Green River Tusher Diversion Biologic including cell service, one year	\$ 1,573.08	1	\$ 1,573.08	\$ 1,604.55	1	\$ 1,604.55
	4	Cell, Price Stub Biologic including cell service, one year	\$ 1,573.08	1	\$ 1,573.08	\$ 1,604.55	1	\$ 1,604.55
	4	Cell, Price River Woodside Biologic including cell service, one year	\$ 1,574.13	1	\$ 1,574.13	\$ 1,605.61	1	\$ 1,605.61
		Cell, Price River Mounds Biologic including cell service, one year	\$ 1,575.17	1	\$ 1,575.17	\$ 1,606.67	1	\$ 1,606.67
	4	Satellite, Price River Confluence Biologic including satellite service, one year	\$ 3,058.78	1	\$ 3,058.78	\$ 3,119.95	1	\$ 3,119.95
	4	Satellite, Dolores Rio Mesa Biologic including satellite service, one year	\$ 3,058.78	1	\$ 3,058.78	\$ 3,119.95	1	\$ 3,119.95
	4	Satellite, San Rafael Chaffin Ranch Biologic including satellite service, one year	\$ 3,058.78	1	\$ 3,058.78	\$ 3,119.95	1	\$ 3,119.95
	4	Satellite, San Rafael Hatts Ranch Biologic including satellite service, one year	\$ 3,058.78	1	\$ 3,058.78	\$ 3,119.95	1	\$ 3,119.95
	4	Satellite, San Rafael Cottonwood Wash Biologic including satellite service, one year	\$ 3,058.78	1	\$ 3,058.78	\$ 3,119.95	1	\$ 3,119.95
	4	Satellite, White River Bonanza Bridge Biologic including satellite service, one year	\$ 3,058.78	1	\$ 3,058.78	\$ 3,119.95	1	\$ 3,119.95
					\$ 26,221.22			\$ 26,745.63

SUMMARY OF MATERIALS AND SUPPLIES

Communications (to be paid directly by USBR/	Yr 5 Escalation Rate	2.00%
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			Year 5			
	Task # or Description	Item Description	Unit Price	Unit Quantity	Subtotal	TOTAL
	4	Cell, Green River Canal Fish Screen Biologic including cell service, one year	\$ 1,636.64	1	\$ 1,636.64	\$ 7,868.51
	4	Cell, Green River Tusher Diversion Biologic including cell service, one year	\$ 1,636.64	1	\$ 1,636.64	\$ 7,868.51
	4	Cell, Price Stub Biologic including cell service, one year	\$ 1,636.64	1	\$ 1,636.64	\$ 7,868.51
	4	Cell, Price River Woodside Biologic including cell service, one year	\$ 1,637.72	1	\$ 1,637.72	\$ 7,873.72
		Cell, Price River Mounds Biologic including cell service, one year	\$ 1,638.80	1	\$ 1,638.80	\$ 7,878.92
	4	Satellite, Price River Confluence Biologic including satellite service, one year	\$ 3,182.35	1	\$ 3,182.35	\$ 15,299.88
	4	Satellite, Dolores Rio Mesa Biologic including satellite service, one year	\$ 3,182.35	1	\$ 3,182.35	\$ 15,299.88
	4	Satellite, San Rafael Chaffin Ranch Biologic including satellite service, one year	\$ 3,182.35	1	\$ 3,182.35	\$ 15,299.88
	4	Satellite, San Rafael Hatts Ranch Biologic including satellite service, one year	\$ 3,182.35	1	\$ 3,182.35	\$ 15,299.88
	4	Satellite, San Rafael Cottonwood Wash Biologic including satellite service, one year	\$ 3,182.35	1	\$ 3,182.35	\$ 15,299.88
	4	Satellite, White River Bonanza Bridge Biologic including satellite service, one year	\$ 3,182.35	1	\$ 3,182.35	\$ 15,299.88
					\$ 27,280.54	\$ 131,157.45