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## **FISHERY AND LAKE MANAGEMENT PROPOSAL**

### **SILVER CREEK LAKES, COLORADO**

Absolute Natural Resources, LLC (ANR) was requested to examine aquatic resource components of Silver Creek Lakes and formulate a proposal for long term, cost effective management of these resources. The proposal outlined below is based on our professional judgment of site observations and extensive experience managing aquatic resources throughout the Rocky Mountain region.

#### **Company Background**

ANR is a professional aquatic and terrestrial ecological consulting and resource management firm operating throughout the Rocky Mountain and Great Plains regions. With offices in Arvada and Windsor, Colorado, ANR is an exclusive Cabela's Trophy Properties Landowner Services provider in Colorado, Nebraska, New Mexico and Kansas; offering a full array of fishery, wildlife, pond and lake, habitat, and recreational property management services to a variety of clients. ANR currently manages over 500 ponds and lakes in 15 states.

ANR is staffed with professional fishery and wildlife biologists, wetland scientists, limnologists, and field and laboratory technicians. All of our staff members have a minimum of a BS degree in respective fields, with many having advanced degrees (i.e., MS and PhD levels). We also staff certified GIS specialists and our firm is both certified and associated with The Mapping Network, an organization of professional land and water mapping specialists throughout North America.

ANR owns and operates its own biological and water quality laboratory. We are often called upon to process and analyze a variety of laboratory samples, including those related to water and soil chemistry, aquatic and terrestrial invertebrates, aquatic and terrestrial plants, fish and wildlife stomach contents, biological tissue, and necropsy analyses. Our laboratory operates under strict, standard scientific methods and quality assurance protocols.

Our firm strives to enhance and manage aquatic and terrestrial resources using safe, cost-effective methods. Our first approach is always the application of safe, biological techniques for water quality, nutrient, and algae and weed management purposes.

*Lake and Land Use Mapping*  
*Aquatic & Terrestrial Habitat Restoration*  
*Recreational Property Enhancement*  
*Aquatic Biological Laboratory Services*

*Fishery and Wildlife Management*  
*Wetland Investigation and Mitigation*  
*Environmental Compliance Studies*  
*Pond and Lake Management*

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## Existing Resources

ANR conducted a site inspection for preparation of this proposal. The Silver Creek Lakes complex consists of 19 beaver ponds and three larger reservoirs that are fed primarily by Silver Creek. The ponds support well developed shorelines consisting of grasses (*Carex* spp.), wild flowers and willows (*Salix* spp.). Although the majority of shoreline was stable with minimal erosion, there were a few areas, such as the island on Pond 1 that would benefit from stabilization by use of native vegetation or rock rip-rap.

The complex consists of a well functioning water exchange system that provides opportunities for water to be oxygenated en route from one pond to the next. The stream enters the property at an approximate elevation of 8,991 ft and exits the property at approximately 8,903 ft. The elevation drop is about one foot every 60 ft; a 1.67% grade over the mile-long stretch of the property. This is a very gradual slope for a mountain valley and the area is ideal location for supporting beaver ponds. Typically, mountain streams at this elevation are highly oxygenated but lack an abundance of aquatic insects. Insects observed during the visit included *Callibaetis* sp. mayflies, adult damselflies, ants, and early instars of grasshoppers. Hay/straw bales were placed in different locations throughout the pond complex to promote insect growth. Water clarity was excellent which is common in mountain ponds in the region. The combination of clear and shallow water can lead to excessive plant growth due to light being able to penetrate to the bottom of the pond.

Overall, the majority of ponds appeared to be relatively shallow. Fish Committee members stated that many of the beaver ponds had been excavated recently and some are scheduled for such in the future. Permits are required for this type of operation and can be obtained through the US Army Corps of Engineers (COE).

Light growths of filamentous algae (*Cladophora* sp.) were observed during the site visit; however, the ponds likely experience denser growths during warmer months. Common waterweed or elodea (*Elodea* sp.) and pondweeds (*Potamogeton* spp.) were relatively dense along littoral areas of the ponds.

Elodea has slender stems (up to 1m long) that emerge from a shallow rootstalk. The small lanced-shaped leaves attach directly to the stem. Leaves are in whorls of three, or occasionally only two and tend to be more crowded toward the stem tips. The branching stems often form a tangled mat that can become a nuisance. These branching stems offer valuable shelter and foraging opportunities for insects and fish, although very dense stands can obstruct fish movement. Vegetation also provides food for muskrats and waterfowl.

Pondweeds are found throughout North America and have many benefits to the environment. Their rhizomes anchor sediment and the diversity of their leaves provides homes for a host of invertebrates. They are also one of the most important waterfowl food plants in North America. Pondweed beds often represent essential fish habitat, offering shelter, foraging areas, and for some fish, spawning sites. They are also consumed by marsh birds, shorebirds, muskrats, beavers, deer and moose. Dense pondweed mats can also obstruct fish movement and limit ease of fishing.

Fish observed during the site visit included rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), cutbow trout (*O. mykiss* x *O. clarkii*), and brook trout (*Salvelinus fontinalis*). One cuttbow was captured and appeared to be in good health; however, Fish Committee members stated that only 60-80% of the fish population is healthy. Comments were made that many fish were stunted. This can probably be attributed to overcrowding (through overstocking) and an overall lack of forage. A fishery survey could be conducted that would provide more detailed information related to fish population health. Managing for an optimal fishery requires a thorough understanding of the physical, chemical and biological components of the ponds.

Silver Creek has the potential to become a quality and possibly excellent fishery through habitat restoration efforts; primarily through critical pool and spawning habitat development. Currently, Silver Creek is dominated by riffle and run habitat, with very limited pool quality. Fish Committee members have observed spawning activity by rainbow and brown trout in certain sections of the creek and brown trout recruitment has been confirmed.

### **Proposal for Professional Services**

The information below presents our base proposal for assessing, managing and monitoring Silver Creek Lakes' aquatic resources. Essentially, these services include: 1) assessment of the fish populations and development of a long term, cost effective fishery management plan, 2) development of a comprehensive lake management plan (i.e., for management of water quality, algae and weeds, and fish habitat), 3) implementation of a water quality monitoring program, and 4) formulation of a stream habitat enhancement design. Each of these proposed tasks is discussed below.

#### **Fishery Survey and Long Term Management Plan Development**

Based on information gathered on site it was clear there was concern from committee members about the overall health and integrity of fish populations in the Silver Creek Lakes complex. To address these concerns in a manner where fish populations will be better managed, we propose that a fishery surveys be conducted for Ponds 1 and 3, as well on selected reaches of Silver Creek. Gill nets, trap nets and seines will be used on the ponds. A backpack electrofishing unit will be used to sample the fish population in Silver Creek.

We propose that the fishery surveys be conducted in fall 2010, a period when fish are most vulnerable to sampling gear and when young-of-year fish can be sampled. Surveys will be used to assess species composition, population balance, density or relative abundance, age-class composition, body weight condition, and overall population health. During the survey, all captured fish will be identified, enumerated, measured, weighed, examined for anomalies and released. Results of the surveys will be used to identify limiting factors and management requirements for maintaining healthy fisheries. All survey results and management recommendations will be provided in a long term (i.e., five year) fishery management plan. This plan will outline recommended actions over a five year period, which may include a long term fish stocking schedule, fish removal needs (if any), harvest regulations, and habitat enhancement requirements.

Collection and analysis of fish population data are vital for acquiring an understanding of a fishery and subsequent development of a successful management plan. Data will also help us determine which species may be better suited to the conditions found at Silver Creek Lakes.

Oftentimes, ponds are overstocked with fish and forage availability becomes significantly limited. This is a common cause of stunting in trout populations, especially at elevations above 8,000 ft where invertebrate abundance is limited. In such case, use of a supplemental feeding program can enhance foraging and improve overall fish growth and health.

The fishery management plan will include fish stocking rates for each pond (1-22). These rates will be based on the amount of habitat, the size, volume and quality of each pond. Survey data will be thoroughly assessed so that overstocking and stunting do not occur and ideal conditions exist for all fish in the population to thrive. Survey data will also be used to determine which species are best suited for this environment. For example, species with a high relative weight index value will be recommended for future stocking. If a particular species shows tendency toward stunting, they will be removed from the stocking program.

Stocking records from May 1983 to present show a variety of species have been stocked over the years. We received 21 stocking records from Mr. Les Anderson. From our perspective, these impoundments may have been overstocked for years. In addition, funds spent for stocking are often better used for other actions that may enhance existing fish populations. These typically include development of habitat, implementation of supplemental feeding programs, and improved water quality management. We propose that future stockings be eliminated until fishery surveys and management plan are completed.

Upon development and implementation of the fishery management plan, a volunteer angler survey can be used to monitor, at least on a minimal and general basis, success and future needs of such plan. In this manner, residents and guests will be encouraged to report fishing effort and success by simply completing angler cards. Data are analyzed after each fishing season, and data can be very useful for assessing the fish population, in general. A volunteer angler survey design will be included in the fishery management plan.

### **Comprehensive Lake Management Plan**

Ponds and lakes age and change throughout their life and are not just static bodies of water. Many of the life processes of a pond or lake are destructive in that they ultimately lead to reduced integrity and deterioration. Silver Creek Lakes are in a valley with a gradual slope which allows silt and dead plant and animal wastes to settle within the bottom sediments. Thus, ponds gradually accumulate undesirable wastes, resulting in excessive growths of weeds and algae. Overall, through time, this nutrient loading decreases the life of the pond. Through experience, we have assembled an arsenal of tools to enhance and maintain ponds and lakes on a cost effective, long term basis. However, in order to determine which tools to use and how such should be applied, it is first necessary to gather baseline data to assess limiting factors and facilitate proper management actions. Essentially, a lake management plan is necessary to outline and prioritize specific tasks needed to properly manage physical, chemical and biological components of an aquatic resource.

We propose to conduct surveys on all ponds to evaluate overall health of each important component (i.e., physical, chemical and biological) to identify and measure factors that restrict such ponds from sustaining adequate (or optimal) health and integrity. Surveys for larger ponds will be more in depth, as water quality, morphology and biological communities will be evaluated. For smaller ponds these surveys will be more visually assessed, in general.

Survey data for each pond will be compiled, analyzed and used to formulate a long term lake management plan. This plan, which can be integrated with the fishery management plan if both tasks are approved, will provide recommendations and guidelines for enhancing and maintaining all aspects of each pond. In general, these recommendations and guidelines will include, but not be limited to: 1) water quality management, 2) aquatic weed and algae control, 3) planktonic algae control, 4) and sedimentation and erosion control. These primary management needs are discussed below.

### *Water Quality Management*

Nutrient loading is probably the most important factor to consider when managing water quality in a pond or lake. Excess nutrient loading increases production of algae and weeds, causes excessive accumulations of organic sediment, and reduces water quality (especially dissolved oxygen). Overall, this greatly affects fish communities and limits fish density and growth. Thus, to manage for a quality fishery, water quality must be maintained at optimal levels.

Many tools can be used to improve and maintain water quality in a pond or lake, including bacteria inoculation, aeration, and oxygen conditioning using peroxide oxidizers. Results of the pond surveys will be used to determine which methods would benefit the ponds. Upon identification of proper methods, specifications and application rates of proper tools will be included in the lake management plan.

### *Aquatic Weed and Algae Control*

We have assisted clients for several years with prevention and control of filamentous algae and weed growths in their ponds and lakes. During the surveys, we will identify what algae and plants occur in the ponds, at what densities. To determine necessary methods for prevention and eradication, it is necessary to also measure species composition to better identify target species. This in turn will allow us to determine if algae and weeds can be controlled using bacteria, oxidizers, algaecides, herbicides, or a combination of these.

Greg Brunjak, with Quality Fisheries Management, prepared an “Aquatic Weed Control Program” in 2006 and 2007 for the ponds. The information given was listed under “General Considerations” which were mostly safety precautions and “Specific Considerations” which were application rates for all the ponds. Within our lake management plan we will be more specific as to application rates for each individual pond. Additionally, we would never recommend tank-mix applications of Reward and Cutrine Plus, as this could result in a significant fish kill, especially for trout.

The proposed lake management plan will address specific concerns related to the property on a pond by pond basis. Essentially, the plan will outline specific methods, applications rates and schedules for tasks associated with algae and weed control. We will strive to specify use of environmentally safe products, including biological controls, when addressing algae and weed control.

#### *Planktonic Algae Control*

Planktonic algae can often be detrimental to a pond and its fish community. Such can also be toxic to fish (e.g., blue-green algae) when blooms are left unchecked. Planktonic algae can be prevented and controlled using a number of methods, including bacteria inoculation, oxidizer application, and algicide treatment. Determination of proper methods will be made based on survey results and will be included in the lake management plan.

#### *Sedimentation and Erosion Control*

There are several ponds on the site that are excavated annually or bi-annually. Permits are required by law before this type of work can occur. These excavations are a necessary, but unfortunately costly, for maintaining fish habitat. Given this, we preliminarily identified a few locations where permanent sedimentation basins could be constructed, thereby protecting ponds and reducing overall costs. The lake management plan will include recommendations and preliminary designs for these sediment basins.

Several areas in need of erosion control were identified during the site visit. These areas are influenced by wind, wave action and storm runoff. In general, erosion likely reduces depth and habitat quality of the ponds, as well as overall water quality. The lake management plan will address these vulnerable areas and what actions should be taken to remedy the problem.

#### *Other Implications*

The lake management plan will include a number of recommendations for improving and maintaining aquatic resources on Silver Creek Lakes. An example that comes to mind is the design and development of an onsite fathead minnow (i.e., used for forage purposes) nursery by relatively simple modification and utilization of one of the beaver ponds. Another example is the establishment of a supplemental trout feeding program, especially in spring and fall, using automatic feeders and specialized feeds to promote growth and winter survival. These and other actions will be provided in the lake management plan.

#### **Long Term Water Quality Monitoring**

We propose to develop and implement a long term water quality monitoring program on an annual basis to assess trends and identify immediate management needs. We have found through years of experience that annual sampling improves overall management capabilities and ensures cost effectiveness. With our proposed program, we will collect and analyze water samples May of each year.



Parameters will include temperature, pH, ammonia, nitrite, chloride, hardness, alkalinity, carbon dioxide, dissolved oxygen, phosphorus and sulfate. We will also measure chlorophyll *a*, an indicator of algae biomass, nutrient levels and overall pond health. All samples will be processed and analyzed in our in-house laboratory.

The water quality monitoring program will be used to evaluate the existing management program and identify immediate pond problems and corrective actions. Results will also be used to establish and maintain a long term database, thereby documenting trends. This will allow us to evaluate pond problems that may occur in the future (e.g., contamination or pollution from other sources, etc.). Water quality reports will be submitted to the client after each sampling.

We will collect water samples each year from three different sites. The first will be on Silver Creek located directly above the property. This will represent the reference site where inferences can be made among the other two sites. The second site will be located on either Pond 12 or 13. These ponds receive sediment, detritus and runoff from all the ponds upstream, and therefore should have a reduced water quality than Pond 22. The final site will be located near the outlet of Pond 1 on the downstream side of the property. Data from these sites will give us a good understanding of the chemical characteristics of the ponds.

### **Stream Habitat Enhancement Design**

One of the main priorities of the Fish Committee is to improve stream fishing quality in Silver Creek. To better understand this stream's fish production potential, we must first understand the processes at work within the watershed. Geology, topography, precipitation, soils, vegetation and human impacts all work together to influence the stream and its biological characteristics. An important part of any stream assessment is becoming familiar with historical stream surveys (habitat and population), sediment sources, hydrology, water appropriations and impoundments, timber and other resources, management practices, and with zoning or other restrictions. This data will provide basic information on past and present land management practices, present and potential fish production and statistical information on water and fish habitat quantity and quality. This helps to provide a basis for development of a stream habitat improvement plan. Following this preliminary watershed assessment, ANR biologist and technicians will conduct a comprehensive stream habitat survey to be used as the primary means to formulate a detailed stream habitat enhancement design.

For consideration of habitat improvement along Silver Creek (within property boundaries), it is first necessary to identify reaches of the system that are conducive for such action. In addition, and upon selection of target stream reaches, it is necessary to formulate habitat enhancement designs, not only to ensure cost effectiveness of construction, but also to comply with permit requirements.

Overall, a habitat enhancement plan for this segment of Silver Creek (i.e., for selected reaches or sites) may include, but not be limited to, bank stabilization and protection, flow and channel alteration by placement of various structures (which also improves substrate for spawning, etc.), and development of critical pool habitat for supporting healthy, year-round fisheries.

We recommend that a survey be conducted to evaluate existing habitat conditions and identify areas or stream reaches that would benefit from habitat improvement. This survey would be used to measure and describe existing instream and riparian conditions, and will ultimately be used to develop a comprehensive habitat improvement plan (or design). It is recommended that the survey and habitat improvement plan be completed in fall 2010, a time when stream flows are optimal for assessing baseline conditions.

Essentially, the survey will be used to characterize existing habitat conditions and quality. Parameters typically measured during the survey include riffle-run-pool ratio, pool quality, channel width, depth, velocity, discharge, channel slope, roughness of channel materials, sediment load, sediment size and composition, bank stability, bank material composition and canopy, bank angle and undercut percentage, and other instream and riparian features. Once the stream has been classified, we will be able to determine which habitat restoration structures and techniques are most suitable for Silver Creek. Permits will be required during actual implementation of the design (i.e., from COE, State of Colorado, and possibly county). It is important to note that we will not implement the construction phase without acquisition of all necessary permits.

### **Additional Services**

ANR is certified by The Mapping Network as a professional land and water mapping service provider. Our pond and lake mapping technology uses state of the art GPS, GIS, sonar and satellite imagery technologies. Essentially, subfoot-accurate GPS locations and precise depths are measured once per second while mapping, providing over 1,000 data points for a one-acre pond. No other mapping technology compares with this technique.

We strongly recommend that the larger ponds be mapped for a variety of reasons. First, the pond maps can be used to provide baseline information, thereby allowing for the monitoring of sedimentation and shoreline changes over time. The maps can also be used to identify and measure dredging needs in the future. Construction of the pond maps will provide information necessary to cost-effectively formulate fishery and pond management strategies, including but not limited to: 1) provision of a baseline conditions map, measuring existing depth contours, lake shape, depth regimes, water volume, and habitat quality; 2) identification of fishery management needs, including fish species selection, fish stocking densities, and habitat enhancement strategies; 3) determination of proper bacteria, algaecide and herbicide application rates; 4) identification of proper aeration system requirements and diffuser locations; and 5) provision of a guide for residents and guests for identification of optimal fishing areas and safety zone restrictions.

In general, we propose the mapping of the ponds for the benefit of both the managers and users. That is, the maps will be used to formulate future fishery and pond management plans, yet such will be useful to users for purposes of fishing and identifying safety issues.



## Cost Schedule

### *Fishery Survey and Comprehensive, Long Term Management Plan*

- Objective:** To collect sufficient scientific data for evaluation of existing fishery resources and identification of cost effective management strategies for development of a long term fishery management plan.
- Deliverables:** A comprehensive fishery management plan detailing and prioritizing management strategies.
- Schedule:** Recommended to be completed in fall 2010. Ponds 1 and 3 (gill nets, etc.) and a few sites on Silver Creek (electrofishing) will be surveyed.

**Cost:**

#### Field Labor and Expenses

Fishery Technician	52 h @ \$57/h	\$ 2,964.00
Travel/Mobilization (per person; one-way)	6 h @ \$42/h	\$ 252.00
Mileage (per mile; one-way)	185 mi @ \$0.50/mi	\$ 92.50
Per Diem (per person-day)	8 p-d @ \$48/p-d	\$ 384.00
Lodging (per room-night)	3 r-n @ \$120/r-n	\$ 360.00
<i>Subtotal</i>		<u>\$ 4,052.50</u>

#### Data Analysis and Report Preparation

Fishery Biologist	40 h @ \$67/h	\$ 2,680.00
Fishery Technician	20 h @ \$57/h	\$ 1,140.00
<i>Subtotal</i>		<u>\$ 3,820.00</u>

**Project Task Total** **\$ 7,872.50**

### *Comprehensive Lake Management Plan*

- Objective:** To collect sufficient scientific data for evaluation of physical, chemical and biological characteristics of the ponds to identify existing conditions, limiting factors and management needs for development of a long term lake management plan.
- Deliverables:** A comprehensive lake management plan detailing and prioritizing management strategies. This plan (report) will be integrated with the fishery management plan if both tasks are approved.
- Schedule:** Recommended to be completed in summer (or fall) 2010.

**Cost:**Field Labor and Expenses

Fishery Technician	20 h @ \$57/h	\$ 1,140.00
Travel/Mobilization (per person; one-way)	6 h @ \$42/h	\$ 252.00
Mileage (per mile; one-way)	185 mi @ \$0.50/mi	\$ 92.50
Per Diem (per person-day)	4 p-d @ \$48/p-d	\$ 192.00
Lodging (per room-night)	1 r-n @ \$120/r-n	\$ 120.00
<i>Subtotal</i>		<u>\$ 1,796.50</u>

Laboratory Fees

Inorganic Water Quality	6 samples @ \$92 ea	\$ 552.00
Chlorophyll <i>a</i>	6 samples @ \$55 ea	\$ 330.00
<i>Subtotal</i>		<u>\$ 882.00</u>

Data Analysis and Report Preparation

Fishery Biologist	8 h @ \$67/h	\$ 536.00
Fishery Technician	40 h @ \$57/h	\$ 2,280.00
<i>Subtotal</i>		<u>\$ 2,816.00</u>

**Project Task Total** **\$ 5,494.50**

*Long Term Water Quality Monitoring Program*

**Objective:** To collect sufficient scientific data for evaluation of water quality of the property's aquatic resources to provide long term trend data for evaluation and modification of present and future management actions.

**Deliverables:** Client is responsible for collecting water samples each May and shipping such to ANR's laboratory for analysis (ANR can provide collection containers and shipping cooler if desired). Upon completion, a brief report will be submitted to the client, discussing findings and future management recommendations.

**Schedule:** To be completed in May of each year.

**Cost (Annual):**Laboratory Fees

Inorganic Water Quality	3 samples @ \$92 ea	\$ 276.00
Chlorophyll <i>a</i>	3 samples @ \$55 ea	\$ 165.00
<i>Subtotal</i>		<u>\$ 441.00</u>

**Project Task Total (Annually)** **\$ 441.00**

### *Silver Creek Habitat Enhancement Design*

**Objective:** To develop a stream habitat (instream and riparian) enhancement plan along feasible and optimal reaches of Silver Creek to improve and sustain quality fishery resources on a long term basis by promoting natural reproduction and year-round use by select fish species.

**Deliverables:** A comprehensive stream habitat improvement design and report, including specifications, justifications, plan drawings, GIS maps, agency permitting guidelines, and projected implementation costs.

**Schedule:** Recommended to be completed in fall 2010 (or summer 2011 after peak runoff).

**Cost:**

#### Field Labor and Expenses

Fishery Biologist	30 h @ \$67/h	\$ 2,010.00
Fishery Technician	42 h @ \$57/h	\$ 2,394.00
GIS Specialist	18 h @ \$75/h	\$ 1,350.00
Travel/Mobilization (per person; one-way)	9 h @ \$42/h	\$ 378.00
Mileage (per mile; one-way)	185 mi @ \$0.50/mi	\$ 92.50
Per Diem (per person-day)	15 p-d @ \$48/p-d	\$ 720.00
Lodging (per room-night)	8 r-n @ \$120/r-n	\$ 960.00
<i>Subtotal</i>		<u>\$ 7,904.50</u>

#### Data Analysis, Habitat Design and Report Preparation

Fishery Biologist	60 h @ \$67/h	\$ 4,020.00
Fishery Technician	40 h @ \$57/h	\$ 2,280.00
GIS Specialist	32 h @ \$75/h	<u>\$ 2,400.00</u>
<i>Subtotal</i>		<u>\$ 8,700.00</u>

**Project Task Total** **\$16,604.50**

### *Professional Pond Mapping*

**Objective:** To collect precise and reliable GIS data and construct accurate and detailed pond maps to aid in overall formulation of fishery and lake management plans, as well as to provide fishing maps to the client.

**Deliverables:** Five 11 x 17" copies in each of the contour and three-dimensional formats, as well as electronic files to allow client to print additional copies. Large wall maps can be provided for the cost of \$225 each, if desired.

**Schedule:** Can be completed anytime ponds are not iced.

## Cost (Per Pond):

### Field Labor and Expenses

GIS Mapping Specialist	8 h @ \$67/h	\$ 536.00
Travel/Mobilization (per person; one-way)	3 h @ \$42/h	\$ 126.00
Mileage (per mile; one-way)	185 mi @ \$0.50/mi	\$ 92.50
Per Diem (per person-day)	2 p-d @ \$48/p-d	\$ 96.00
Lodging (per room-night)	1 r-n @ \$120/r-n	\$ 120.00
<i>Subtotal</i>		<u>\$ 970.50</u>

### Data Analysis, Habitat Design and Report Preparation

GIS Specialist	12 h @ \$75/h	\$ 900.00
<i>Subtotal</i>		<u>\$ 900.00</u>

### **Project Task Total (Per Pond)**

**\$ 1,870.50**

Discounts will apply if multiple ponds are selected for mapping at one time.

## Key Project Personnel

The following personnel will be assigned to complete specific tasks associated with performance of tasks proposed herein.

✚ **Tony Byrne:** Tony is a managing partner of ANR. He has an MS degree in aquatic ecology from the University of Denver and a BS degree in fishery biology from Colorado State University. He is an experienced aquatic biologist, having managed ponds and lakes in the Rocky Mountain and Great Plains regions for over 20 years. He is also an experienced aquatic ecology researcher, having conducted several scientific studies for state, tribal and federal agencies since 1985. Tony will be responsible for coordinating all tasks, communicating directly with client representatives, managing the project account, and assisting with actual project tasks.

✚ **Mike Gutzmer:** Mike is our senior aquatic biologist and has a PhD in aquatic and wetland ecology from LaCrosse University, an MS degree in aquatic ecology from Southwest Texas State University (now Texas State University), and a BS degree in fisheries and wildlife management from the University of Nebraska. Mike will be responsible for overall quality control and will be used throughout this project for his expertise in water quality data interpretation and management, aquatic weed identification and control techniques, and lake limiting factor analysis and management strategy formulation. He will be consulted during the entire project term to monitor all project progress and develop needed management strategies.

✚ **Tom Deem:** Tom is our assistant aquatic biologist and has a BS degree in fishery biology from Colorado State University. He will be the coordinator responsible for completion of all duties, including surveys, laboratory tasks and data analysis.

✚ **Wes Friesen:** Wes is our supervising resource technician and has a BS degree in fishery and wildlife biology from Colorado State University. He will be responsible for assisting with all surveys and data analyses.

## Client References

The following include a few clients who we assist with the overall management of fishery and lake resources.

**Kenosha Trout Club** (Grant, CO), Mr. Tony Dursey, Home (303) 838-5006, Cell (303) 278-2715

**Clydesdale Park** (Fort Collins, CO), Mr. John Holloway, Home (970) 482-2264

**Eagle Ranch Estates** (Fort Collins, CO), Mr. David Pond, Kellison Corp., Office (970) 494-0609

**Highland Meadows** (Windsor, CO), Mr. David Pond (see above)

**Oasis Ranch** (Dalton, NE), Mr. Mike Kaul, Two Rivers Emporium (Pinedale, WY), Office (307) 367-4131

**Half Moon Lake Resort** (Pinedale, WY), Mr. Mike Kaul (see above)

We appreciate the opportunity of preparing and submitting this proposal for professional services. Please feel free to contact Tom Deem, Fish & Wildlife Biologist, at (800) 852-4075 or [tdeem@ANRwildlife.com](mailto:tdeem@ANRwildlife.com), if you have questions. We look forward to working with you and assisting with management of this valuable and important resource.

As requested, the table below presents costs for various algaecides, herbicides and other products.

Product	Effective Against	Cost
<i>Cutrine Plus</i> algaecide (liquid)	Filamentous algae (1-2 gal/acre)	\$32.50/gal
<i>Cutrine Plus</i> algaecide (granular)	Filamentous algae (15-20 lbs/acre)	\$68.50/30 lbs
<i>GreenClean Pro</i> peroxide oxidizer (granular)	Filamentous & blue-green algae (50 lbs/acre)	\$135.00/50 lbs
<i>Reward</i> herbicide (liquid; 3-d restriction)	Most pondweeds (1-2 gal/acre)	\$175.00/gal
<i>Aquathol K</i> herbicide (liquid; 14-d restriction)	Many pondweeds (1-2 gal/acre)	\$275.95/2.5 gal
<i>Aqua-Ace</i> bacteria (water soluble packets)	Reduces sludge and detritus (4 lbs/acre/month)	\$562.50/25 lbs
<i>AquaKler</i> oxygen conditioner and peroxide oxidizer (granular)	Adds dissolved oxygen & reduces sludge and detritus; may also kill algae (40-80 lbs/acre; once or twice annually)	\$645.00/40 lbs