

Trustees' Proposed Restoration-Based Alternatives for the Molycorp NRDA: Summary of Scaling Concepts

Molycorp Trustees
March 31, 2006



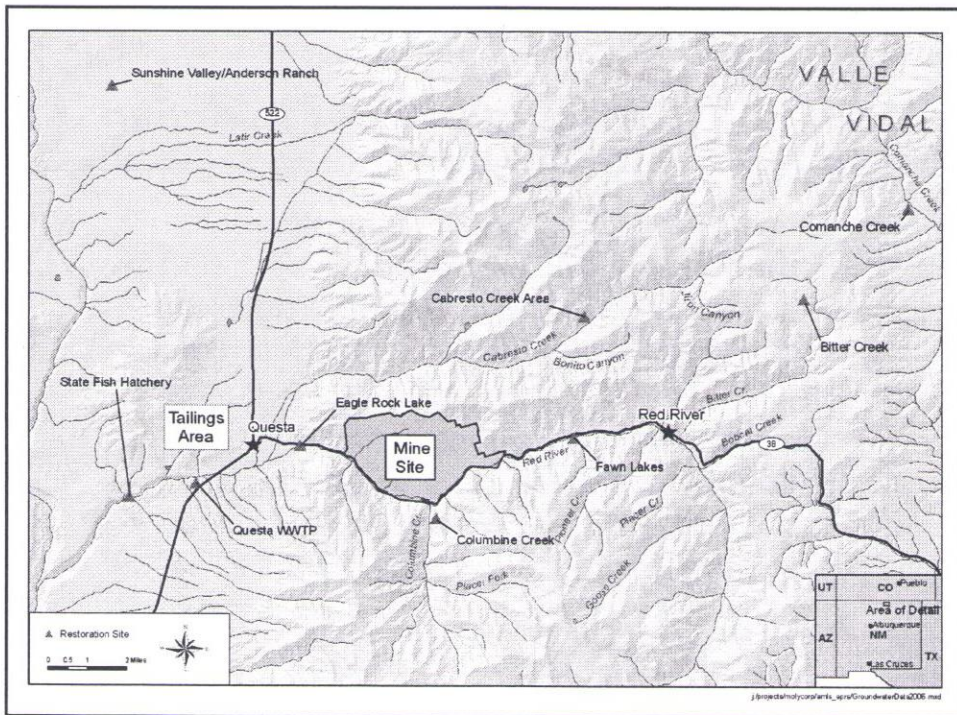
Presentation Objective

- ▶ This presentation contains the scaling frameworks for the restoration-based alternatives that the Trustees have developed as proposed compensation for the Molycorp NRDA
- ▶ The objective of this presentation is to help Molycorp understand the scaling frameworks used by the Trustees to develop the project suite alternatives presented on March 21, 2006



Presentation Overview

- ▶ Individual project scaling frameworks
 - Aquatic resources
 - Terrestrial resources
 - Groundwater resources
- ▶ Summary of restoration credits for proposed restoration solutions – project suite alternatives



Individual Project Scaling Frameworks

- ▶ Project scaling frameworks included all resources benefited by each project
- ▶ Aquatic resource credits quantified using Resource Equivalency Analysis (REA) with units of “discounted kg-years” of fish biomass
- ▶ Terrestrial resource credits quantified using Habitat Equivalency Analysis (HEA) with units of “discounted service acre-years” of terrestrial habitat
- ▶ Groundwater resource credits quantified using protection of groundwater resource under WWTP and water quality/quantity benefits from other restoration projects



Projects to Benefit Aquatic Resources

- ▶ Fish hatchery fish passage enhancement
- ▶ Bitter Creek Rio Grande cutthroat trout protection and habitat improvement
- ▶ Cabresto Creek Rio Grande cutthroat trout protection and expansion
- ▶ Columbine Creek Rio Grande cutthroat trout protection and expansion
- ▶ Valle Vidal Rio Grande cutthroat trout habitat improvement
- ▶ Eagle Rock Lake habitat creation



Fish Hatchery Fish Passage Enhancement: Scaling Framework

- ▶ How credits are generated:
 - Fish passage enhancement would increase brown trout biomass in the high-quality habitat above the hatchery
- ▶ Project assumptions
 - Size of project: 4 acres
 - Width = 19 feet (average width from LR8a, LR16)
 - Length = 1.75 miles (best professional judgment – B. Kuykendall and J. Chadwick)
 - Expected change in biomass: 50% increase
 - Best professional judgment – B. Kuykendall



Fish Hatchery Fish Passage Enhancement: Scaling Framework (cont.)

- ▶ Project assumptions (cont.)
 - Project start year: 2008
 - Years to maturity: 4
 - Duration of benefits: 100 years
 - Assumes maintenance endowment for fish passageway
- ▶ Credit generated
 - 10% of aquatic debit



Bitter Creek Rio Grande Cutthroat Trout Protection and Habitat Improvement: Scaling Framework

- ▶ How credits are generated:
 - Total biomass of Rio Grande cutthroat trout (RGCT) in Bitter Creek would increase in response to improved riparian habitat conditions
- ▶ Project assumptions
 - Size of project: 1.2 acres
 - Width = 4.5' (Average width from NMDGF of 1.37 m = 4.49 feet)
 - Length = 2.25 miles [best professional judgment of Ben Kuykendall, based on conversations with local residents/resource specialists – could potentially be expanded based on additional distance to barrier (J. Chadwick)]
 - Expected change in RGCT biomass: 26.3 kg/acre
 - Assumes that current biomass (NMDGF data) would double after habitat improvement (best professional judgment of Ben Kuykendall)



Bitter Creek Rio Grande Cutthroat Trout Protection and Habitat Improvement: Scaling Framework (cont.)

- ▶ Project assumptions (cont.)
 - Project start year: 2008
 - Years to maturity: 6
 - Duration of benefits: 100 years
 - Assumes maintenance endowment for fencing and project upkeep
 - Holistic project scalar: Credits multiplied by 3 because of value of RGCT
- ▶ Credit generated
 - 20% of aquatic debit



Cabresto Creek Rio Grande Cutthroat Trout Protection and Expansion: Scaling Framework

- ▶ How credits are generated:
 - Total biomass of RGCT in Cabresto Creek would increase in response to reduced competition from brook trout
- ▶ Project assumptions
 - Size of project: 5.6 acres
 - Width = 7' [Weighted average of three width measurements (3', 6', 8') from Chadwick Ecological Consultants (CEC) in the Cabresto Creek Field Evaluation report]
 - Length = 6.6 miles (The length is equal to sections 2 and 3 in the above-referenced report minus 0.3 mi. to account for the placement of the barrier slightly upstream of Bonito Canyon and that in drier years fish are not present as far upstream as was documented in this study. Assumes genetic purity from Jiron to Bonito Canyon).



Cabresto Creek Rio Grande Cutthroat Trout Protection and Expansion: Scaling Framework (cont.)

- ▶ Project assumptions (cont.)
 - Expected change in RGCT biomass: 15.6 kg/acre
 - Assumes that 70% of current brook trout biomass (from CEC report) becomes RGCT biomass
 - Assumption of 70% gain based on Thompson & Rahel (1996) who reported 68% increase in RGCT, two years after removing brook trout with electrofishing on "Nameless" Creek
 - Project start year: 2008
 - Years to maturity: 4
 - Duration of benefits: 100 years
 - Assumes maintenance/monitoring endowment in place for electrofishing every 3 – 5 years



Cabresto Creek Rio Grande Cutthroat Trout Protection and Expansion: Scaling Framework (cont.)

- ▶ Project assumptions (cont.)
 - Holistic project scalar: Credits multiplied by 3 because of value of RGCT
- ▶ Credit generated
 - 38% of aquatic debit



Columbine Creek Rio Grande Cutthroat Trout Protection and Expansion: Scaling Framework

- ▶ How credits are generated:
 - Total biomass of RGCT in Columbine Creek would increase in response to reduced competition from brown trout
- ▶ Project assumptions
 - Size of project: 2.6 acres
 - Width = 12.2' (Chadwick 1999 data)
 - Length = 1.75 miles (based on GPS data collected by Ben Kuykendall walking length of stream)
 - Expected change in RGCT biomass: 14 kg/acre
 - Assumes that 70% of current brown trout biomass (average of 1997 – 2004 CEC data) becomes RGCT biomass



Columbine Creek Rio Grande Cutthroat Trout Protection and Expansion: Scaling Framework (cont.)

- ▶ Project assumptions (cont.)
 - Project start year: 2008
 - Years to maturity: 4
 - Duration of benefits: 100 years
 - Assumes maintenance/monitoring endowment in place for electrofishing every 3 – 5 years
 - Holistic project scalar: Credits multiplied by 3 because of value of RGCT
- ▶ Credit generated
 - 16% of aquatic debit



Valle Vidal Rio Grande Cutthroat Trout Habitat Improvement: Scaling Framework

- ▶ How credits are generated:
 - Total biomass of RGCT in the Valle Vidal (Comanche Creek) would increase in response to habitat improvement
- ▶ Project assumptions
 - Size of project: 3.0 – 4.6 acres
 - Width = 7.9' (this value is based on the average width at NMDGF sampling sites on Comanche Creek between the confluences of Little Costilla and Vidal Creek)
 - Length = 3.1 – 4.8 miles (length adjusted depending on amount of credit needed)
 - Expected change in RGCT biomass: 13 kg/acre
 - Assumes doubling of current biomass following habitat improvement (best professional judgment – B. Kuykendall)
 - Current biomass from 2001, 2005 NMDGF data



Valle Vidal Rio Grande Cutthroat Trout Habitat Improvement: Scaling Framework (cont.)

- ▶ Project assumptions (cont.)
 - Project start year: 2008
 - Years to maturity: 6
 - Duration of benefits: 100 years
 - Assumes maintenance endowment in place for habitat improvements
 - Holistic project scalar: Credits multiplied by 3 because of value of RGCT
- ▶ Credit generated
 - 25% – 38% of aquatic debit depending on project size



Eagle Rock Lake Habitat Creation: Scaling Framework

- ▶ How credits are generated:
 - New pond built near existing Eagle Rock Lake would be stocked with rainbow trout on same schedule as Eagle Rock Lake
- ▶ Project assumptions
 - Size of project: 2.0 acres
 - Size of pond shown on GIS map produced by MolyCorp and shared on April 2005 site visit
 - Expected change in rainbow trout biomass: 190 kg/acre
 - Assumes rainbow trout stocked at 1,200/acre
 - Assumes rainbow trout are 9.5" long and weigh 158 g (based on Red River hatchery data)



Eagle Rock Lake Habitat Creation: Scaling Framework (cont.)

- ▶ Project assumptions (cont.)
 - Project start year: 2008
 - Years to maturity: 4
 - Duration of benefits: 100 years
 - Assumes maintenance endowment in place for new pond
 - Holistic project scalar: Credits divided by 5 because of limited lifespan of rainbow trout compared to resident brown trout
- ▶ Credit generated: 16% of aquatic debit



Projects to Benefit Terrestrial Resources

- ▶ Fawn Lakes riparian enhancement
- ▶ Eagle Rock Lake riparian and wetland habitat creation
- ▶ Sunshine Valley – Anderson Ranch protection
- ▶ Valle Vidal riparian improvements



Fawn Lakes Riparian Habitat Enhancement: Scaling Framework

- ▶ How credits are generated:
 - Riparian habitat would be reconnected to floodplain and conifers would be thinned to promote deciduous growth
- ▶ Project assumptions
 - Size of project: 2.5 acres
 - Estimated by B. Kuykendall based on maps and aerial photos
 - Expected service increase: 80%
 - Accounts for services of existing habitat where riparian habitat would be restored
 - Project start year: 2008
 - Years to maturity: 6



Fawn Lakes Riparian Habitat Enhancement: Scaling Framework (cont.)

- ▶ Project assumptions (cont.)
 - Duration of benefits: 100 years
 - Assumes maintenance endowment in place for riparian habitat
- ▶ Credit generated: 2% of terrestrial debit



Eagle Rock Lake Riparian and Wetland Habitat Creation: Scaling Framework

- ▶ How credits are generated:
 - Riparian and wetland habitat would be created together with new pond, OR
 - Wetland habitat would be created separately
- ▶ Project assumptions
 - Size of project: 1 acre wetland, 1 acre riparian
 - 1 acre wetland based on Molycorp map
 - 1 acre riparian based on a 20 foot buffer around 3 acres (pond + wetland)
 - Expected service increase: 90%
 - Accounts for services of existing upland habitat where riparian and wetland habitat would be created
 - Project start year: 2008
 - Years to maturity: 6



Eagle Rock Lake Riparian and Wetland Habitat Creation: Scaling Framework (cont.)

- ▶ Project assumptions (cont.)
 - Duration of benefits: 100 years
 - Assumes maintenance endowment in place for riparian and wetland habitat
 - Holistic project scalar: Credits for wetland multiplied by 10 to account for value of wetland habitat in arid environment compared to baseline forested riparian habitat used for debit calculations
- ▶ Credit generated:
 - 13% of terrestrial debit (wetland only)
 - 14% of terrestrial debit (wetland and riparian)



Sunshine Valley/Anderson Ranch Habitat Protection: Scaling Framework

- ▶ How credits are generated:
 - Diverse wildlife habitat is protected from cattle grazing
- ▶ Project assumptions
 - Size of project: 1.3 acres open water; 122 acres wet-marshy; 150-200 acres uplands
 - Open water and wet-marshy acreage based on GIS analysis of satellite imagery
 - Upland acreage varies according to credits needed
 - Expected service increase:
 - 20% increase for open water and upland habitat
 - 40% increase for wet-marshy habitat
 - Based on expected benefit of grazing removal
 - Project start year: 2008
 - Years to maturity: 4



Sunshine Valley/Anderson Ranch Habitat Protection: Scaling Framework (cont.)

- ▶ Project assumptions (cont.)
 - Duration of benefits: 100 years
 - Assumes maintenance endowment in place to manage habitat and maintain easement
 - Holistic project scalars:
 - Upland credits divided by 5 to account for baseline comparison
 - Open water credits multiplied by 10 to account for baseline comparison
 - Total credits for project multiplied by 1.5 to account for value of protecting large area (> 270 acres) of diverse habitats
- ▶ Credit generated:
 - 84% – 87% of terrestrial debit, depending on total acreage



Bitter Creek and Valle Vidal Riparian Habitat Improvement: Scaling Framework

- ▶ How credits are generated:
 - Riparian habitat would be improved as part of the aquatic habitat restoration projects
- ▶ Project assumptions
 - Size of project – Bitter Creek: 13.7 acres
 - Assumes 25' riparian width on each side of creek (B. Kuykendall estimate); see aquatic section for length estimate
 - Size of project – Valle Vidal: 7.5 – 11.7 acres
 - Assumes 10' riparian width on each side of creek (B. Kuykendall estimate); see aquatic section for length estimates



Bitter Creek and Valle Vidal Riparian Habitat Improvement: Scaling Framework (cont.)

- ▶ Project assumptions (cont.)
 - Expected service increase: 50%
 - Accounts for services of existing habitat where riparian habitat would be restored
 - Project start year: 2008
 - Years to maturity: 6
 - Duration of benefits: 100 years
 - Assumes maintenance endowment in place for riparian habitat improvements
- ▶ Credit generated:
 - Bitter Creek: 6% of terrestrial debit
 - Valle Vidal: 3% – 5% of terrestrial debit, depending on acreage



Projects to Benefit Groundwater Resources

- ▶ Questa WWTP upgrade
- ▶ Fawn Lakes riparian enhancement
- ▶ Eagle Rock Lake wetland habitat creation
- ▶ Sunshine Valley – Anderson Ranch protection
- ▶ Valle Vidal riparian improvements (sediment control)



Questa WWTP Upgrade: Scaling Framework

- ▶ How credits are generated:
 - Nitrate levels in groundwater would decrease by upgrading the Questa WWTP
 - Currently the WWTP exceeds effluent permit levels
 - 35 to 45 mg/l versus permit level of 20 mg/l and gw standard of 10 mg/l
 - The quantity of groundwater underneath the WWTP that would be protected from reduced quality is basic measure of benefits



Questa WWTP Upgrade: Scaling Framework (cont'd)

- ▶ Project assumptions
 - Volume of water benefited: 0.5 – 1.5 cfs
 - Project start year: 2008
 - Years to maturity: 3
 - Duration of benefits: 50 years
- ▶ Credit generated based on recent local well data
 - 15% – 25% of groundwater debit
- ▶ Cost to upgrade WWTP approximately \$3 million dollars



Fawn Lakes Riparian Groundwater Enhancement: Scaling Framework

- ▶ How credits are generated:
 - Flow in Red River benefits from reduced sedimentation, following Fawn Lakes riparian improvement
- ▶ Project assumptions
 - Volume of water benefited: 46.3 cfs
 - Mean annual cfs in Red River from 1980 to 2003
 - Percent improvement in water quality: 1%
 - Project start year: 2008
 - Years to maturity: 6
 - Duration of benefits: 100 years
- ▶ Credit generated:
 - 5% of groundwater debit



Valle Vidal Riparian Groundwater Enhancement: Scaling Framework

- ▶ How credits are generated:
 - Flow in Comanche Creek benefits from reduced sedimentation, following Valle Vidal riparian improvement project
- ▶ Project assumptions
 - Volume of water benefited: 2 cfs
 - Estimated flux in Comanche Creek
 - Percent improvement in water quality: 20%
 - Estimated based on reduced sediment
 - Project start year: 2008
 - Years to maturity: 6
 - Duration of benefits: 100 years
- ▶ Credit generated:
 - 4% of groundwater debit



Anderson Ranch Groundwater Enhancement: Scaling Framework

- ▶ How credits are generated:
 - Flow out of Anderson Ranch wetlands benefits from removal of cattle project assumptions
 - Volume of water benefited: 0.4 cfs
 - Estimated flux out of wetlands
 - Percent improvement in water quality: 20%
 - Estimated based on reduced sediment, fecal coliform
 - Project start year: 2008
 - Years to maturity: 4
 - Duration of benefits: 100 years
- ▶ Credit generated:
 - 1% of groundwater debit



Eagle Rock Lake Groundwater Enhancement: Scaling Framework

- ▶ How credits are generated:
 - Flow out of Eagle Rock Lake wetland benefits from retention in wetland
 - Volume of water benefited: 2.5 cfs
 - Estimated flux out of new Eagle Rock Lake
 - Percent improvement in water quality: 20%
 - Estimated based on reduced sediment, metals
 - Project start year: 2008
 - Years to maturity: 6
 - Duration of benefits: 100 years
- ▶ Credit generated:
 - 5% of groundwater debit



Groundwater Credit Summary

- ▶ Estimate that all projects together only provide credit for 25% - 35% of debit
- ▶ Trustees would like to investigate opportunities for additional credits
 - Transfer / retirement of water rights
 - Application of some rights to existing ERL
 - Nexus of retired rights with ecological benefits
 - rights that could provide in-stream aquatic benefits



Proposed New Project Suite #1: Percentage of Debit Compensated by Projects

	Aquatic credit	Terrestrial credit	Groundwater credit
Eagle Rock Lake	16%	13%	5%
Fish hatchery	10%	--	--
Bitter Creek	20%	6%	--
Cabresto Creek	38%	--	--
Columbine Creek	16%	--	--
Anderson Ranch	--	84%	1%
Questa WWTP	--	--	25%
Total	100%	103%	36%



Proposed Project Suite #2: Scaling Summary

	Aquatic credit	Terrestrial credit	Groundwater credit
Eagle Rock Wetland	--	13%	5%
Fish hatchery	10%	--	--
Bitter Creek	20%	6%	--
Cabresto Creek	38%	--	--
Valle Vidal	25%	3%	4%
Anderson Ranch	--	84%	1%
Questa WWTP	--	--	25%
Total	93%	106%	35%



Proposed Project Suite #3: Scaling Summary

	Aquatic credit	Terrestrial credit	Groundwater credit
Fawn Lakes riparian		2%	5%
Fish hatchery	10%	--	--
Bitter Creek	20%	6%	--
Cabresto Creek	38%	--	--
Valle Vidal	33%	4%	4%
Anderson Ranch	--	88%	1%
Questa WWTP	--	--	25%
Total	101%	100%	35%



Conclusion

- ▶ Scaling frameworks based on Trustee analysis of expected restoration benefits
- ▶ Project suites offer a mix of projects that offset debit for aquatic, terrestrial, and groundwater resources

