

Omya California Inc.

7225 Crystal Creek Road

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Annual Reclamation Report 2011



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Daisy (*Erigeron parishii*), Cushenbury Buckwheat (*Eriogonum ovalifolium* var. *vineum*) and Cushenbury Oxytheca (*Oxytheca parishii* var. *goodmaniana*). There is also a collection of sensitive species recognized by the California Native Plant Society and local Forest Service.

The main goal in re-vegetation is to use native pioneer plants to establish the soil components necessary to allow the dominate species to thrive. By doing so the area is suitable for wild life habitat, exotic plants impact decreased, erosion is minimized, and the visual impact is lessened or negated altogether.

Omya follows reclamation plans approved by the County of San Bernardino pursuant to the standards and guidelines specified by the California Surface and Mine Reclamation Act (SMARA) of 1975, and the San Bernardino National Forest (SBNF). The goal of the re-vegetation plan at Omya is to restore native plant and animal components of a functioning biological community to the extent possible. The California Department of Conservation Division of Mines and Geology (1997) requires that reclaimed sites provide wildlife habitat “at least as good as that which existed before...mining”. It states further that sites must be “similar to naturally occurring habitats in the surrounding areas.” While it is unrealistic to develop a climax community with mature Pinyon pine and Blackbush stands within a 10-year monitoring period, quantitative success criteria have been developed with the intent to determine whether vegetation is on a “trajectory” to return to its pre-disturbance cover and composition over time.

The primary reclamation objectives include the establishment of early-succession plants (such as perennial grasses, Rabbit brush, and Sage brush), followed by further

establishment of nursery stock and sown seed. These efforts, supplemented by natural seed dispersal, should serve to eventually return the sites to mature shrub lands and woodlands similar to those originally occurring in the project areas.

There is 19.9 acres currently being re-vegetated at the Omya California site. These areas include the Claudia site, Marker 15, Sentinel overburden, and Marker 50. Marker 50 is located in the Blackbush scrub community; the other sites are above the 6000 ft. elevation mark, in the Juniper woodland and Yellow Pine community. Drip irrigation installed using both micro sprayers and conventional emitter; sites watered, planted, seeded, weeded and monitored all these sites saved Marker 15 are watered with the aid of a water pump.

Seed collection is a year long process as plants flower at different times of the year. A full forty percent of the species flower in fall, after the summer rains. A few species total life cycle is three weeks long and if they are to be included in the re-vegetation plan seeds must be found and collect then. We currently have dried and stored for use at least 82 plant species and several hundred pounds of seed. Omya has a long term view of the mine in Lucerne Valley, an ideal restoration project takes time as soils need time to re-establish the components necessary to sustain complex life processes- this begins with pioneer plants and duff collected from established biological functioning habitats. The living organisms in the soil re-establish the links between the soils nutrients and plant life. Once this is accomplished the pioneer plants give way to the climax species. We accelerate the process with watering regiments that force the growth of the pioneer plants. Omya has done exactly what is best for the site to establish the long term growth of the climax species.

This same plan works for the animal life on the site as well. The animals see their homes in the site as each phase is completed. As the animals move onto the site they bring with them that which helps maintain their home and helps establish the next phase. An example would be the ground squirrel is one of the first to move in; it builds its nest and brings materials from the surrounding area, stores seeds and bedding materials in the nest. The squirrel expires due to predation and the nest is empty, the bedding material becomes wet, the seeds have an ideal growing medium in the nest material. The seeds that were stored are from a year round collection and will aid the site in ways we still only speculate.

Re-vegetation

Marker 50



The .5 acre site, marker 50 or the White Knob Staging area was started in the fall of 2006-Winter 2007. It was decided to reclaim the area to stop the road run off, re-contour the site to match the existing landscape, and originally the idea was to create a site accessible by tour groups to highlight Omya's re-vegetation efforts.

On March 13, 2007 Omya employee Freddy Borroel, re-contoured the site to regulate the flow of water, create micro-climates for plant development and seed catches that would hold on to wind bourn seed. Plants grown at Victor Valley College (VVC) from seed collected from surrounding areas were out-planted on April 24th and 26th. These plants were positioned on the sides of the furrows to protect the plant from the wind and provide some shade. The site also received large pieces of wood debris that was laid out or imbedded in the ground to give the site vertical height and support wildlife.

Plant list out planted from VVC

Botanical Name	Common Name
<i>Ephedra viridis</i>	Mormon Tea
<i>Prunus fasciculata</i>	Desert Almond
<i>Yucca brevifolia</i>	Joshua Tree
<i>Yucca schidigera</i>	Mojave Yucca
<i>Yucca whipplei</i>	Our Lord's Candle

The site was set up on a drip irrigation system. During the first year the plants received water once a week for three hours, each plant had an individual drip to its base. 2007 was very dry year and the site was the only place around where water and moist plants could be found. The plants and drip lines were subjected to predation from local wildlife on a daily basis. The first week 50 plants were devoured and metal cages were installed on the 90 remaining plants. The existing watering lines were utilized with seeds that were collected from surrounding brush and directly sown.

On January 8th and 10th 2008, ten test plots were created to try to determine the best method to direct seed a desert restoration site. The plots were constructed with hemp meshing and vertical mulch. The test was would an artificial water absorption medium help seed germination. The plots were side by side four foot by eight foot with one foot spacing between each. The plots were chosen to represent the different microclimates that are on the site. The following seeds in a mix were applied:

Botanical Name	Common Name
<i>Achnatherum hymenoides</i>	Rice Grass
<i>Achnatherum parishii</i>	Needle grass
<i>Agoseris grandiflora</i>	Giant Dandelion
<i>Chrysothamnus nauseosus</i>	Rabbit Brush
<i>Encelia actoni</i>	Acton's Encelia
<i>Ericameria linearifolia</i>	Golden bush
<i>Eriodictyon trichocalyx</i>	Yerba Santa
<i>Eriogonum fasciculatum</i>	California Buckwheat
<i>Mentzelia laevicaulis</i>	Blazing Star
<i>Purshia tridentata</i>	Antelope Bush
<i>Salazaria mexicana</i>	Paper Bag Bush
<i>Xylorhiza tortifolia</i>	Mojave Aster

The test results were that birds, mice, rats, and ants find there way to any concentration of a seed source. The wind played a role in removing the ruffed edges of

the plots exposing the hemp mesh. This created a wicking effect that drew moisture from the seeds reducing germination.

In 2009, the watering system on the site underwent a change. Utilizing the existing drip irrigation system, micro sprayers on risers were installed. The sprayers cover about 10-15 feet of space depending on whether the pump is attached. These are used to encourage seed growth and plant volunteerism. This method works very well.

Botanical Name	Common Name
<i>Argemone munita</i>	Prickly Poppy
<i>Chaenactis fremontii</i>	Pincushion
<i>Encelia actoni</i>	Acton's Encelia
<i>Eriodictyon trichocalyx</i>	Yerba Santa
<i>Eriogonum deflexum</i>	Flat-top Buckwheat
<i>Eriogonum fasciculatum</i>	California Buckwheat
<i>Eriogonum inflatum</i>	Desert Trumpet
<i>Galium angustifolium ssp. angustifolium</i>	Leafy Bedstraw
<i>Hymenochlea salsola</i>	Burrobush
<i>Larrea tridentata</i>	Creosote Bush
<i>Lepidium fremontii var. fremontii</i>	Desert Alyssum
<i>Loeseliastrum matthewsii</i>	Desert Calico
<i>Mentzelia laevicaulis</i>	Blazing Star
<i>Psathyrotes annua</i>	Turtle Back
<i>Salvia columbariae</i>	Chia
<i>Xylorhiza tortifolia</i>	Mojave Aster

Through the 2011 year the site was watered with the use of water sprayers that were installed in 2009. The site's many volunteer plants grow in between the man made contours (see above table) and have been naturally propagating themselves. Most of the cages have been removed from these plants due to there vigorous growth. The plants on this site are in the final stages of the restoration process, the site's growth, self propagation, and establishment in the spaces between the contours mark this site as well on its way to completion. 2012 will include weed removal, predation repairs, and watering as needed, it will also include monitoring of the site.

Sentinel Overburden

Sentinel Overburden's reclamation began in 2006. The slopes and the top of the berms were out planted with nursery stock plants grown at VVC,



however due to the location of the site and the angle of the slopes the plants were sheared off at their base due to the material picked up by the strong winds. A seed mix was also applied at multiple times to the site. Salvage plants were added as they came available

and planted on the protected side of the berm along side of nursery grown plants.

Irrigation installation was similar to marker 50 and the use of a water pump was required.

Many native climax species of plants in California are slow growing. A Western Juniper for example can take hundreds of years to reach to height seen on the surrounding slopes near the site. Many of the plants that were volunteering and or self propagating the site were pioneer plants such as Blazing Star, Rabbitbrush, and Grinnell's Penstemon. These species are ideal for stabilizing soil, catching airborne seed such as Curl Leaf Mahogany, and creating biomass. More advanced species were encroaching onto the site from both man made efforts and nature's own methods. The site had hundreds if not thousands of plants on it of at least twenty different non-weedy species. However, from a distance and to the untrained eye the site looked bare; it was still that ugly white scar on the mountain side especially after the next tier was added to the dump. This tier had a layer of topsoil and a lot of woody material from the nearby expansion of the dump.

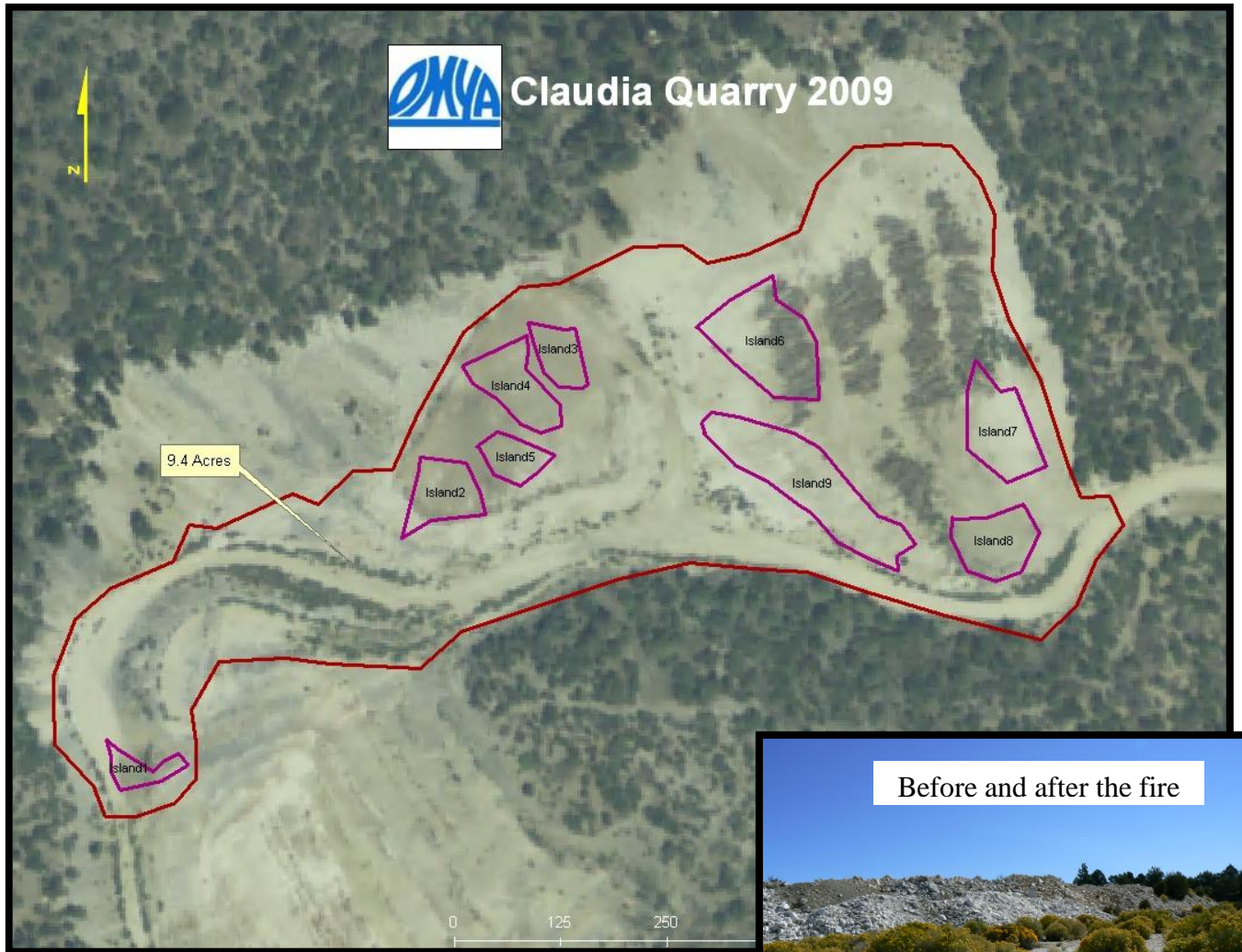
It was decided that the lower tier of the site should receive the same treatment. From a re-vegetation stand point the addition of the topsoil and horizontal mulch would greatly improve the site and speed up the restoration of the habitat. Aggressive seed collecting was carried out on all species on the site, salvage was done in an attempt to save as many plants as possible and the irrigation lines were removed. The topsoil was added to the site in later November-early December of 2010. Final earth moving on the site occurred late 2011 and seeding/irrigation installation will be completed in 2012.

Cloudy

In 2008, the Cloudy site reached its tenth year mark which, according to the Tierra Madre Consultant re-vegetation plan of 1996, the site should be ready to be returned to the Forest Service. In it they provide a pre-disturbance vegetation table which shows that the average amount of *Cercocarpus ledifolius*, Mahogany averages 13.2 plants per plot amongst other plant species averages. “Single-leaf pinyon pine (*Pinus monophyla*) is probably the most characteristic plant throughout the area...Jeffrey pine (*Pinus jeffreyi*) is common at the Cloudy...dense cover of curl-leaf mountain mahogany (*Cercocarpus ledifolius*) and California fremontia (*Fremontodendron californica*)...seem to do well in open areas following disturbance...” (pgs. 7-10).

A report was written up and submitted to the Forest Service in October 2008, in it was information on the stages of re-vegetation (both nursery stock out-plantings and seeded species) of the islands, transects of two islands, quarry road coverage, quarry pit/benches re-vegetation efforts, quarry pit/benches coverage, and tree counts of all areas. For more information see the Cloudy Release report for more detail.

The site is now used as a demonstration of Omya’s completed re-vegetation efforts for tour groups.



Claudia

Originally the Claudia site was to be left as is, there was rich plant life on the overburden pile and along the road ways. However, when the Butler 2 fire burned the existing vegetation it was decided to push the overburden over the road way and create a more natural looking slopes and aspect.

Soil was brought to the site and made into nine islands. Vegetation that survived the fire was not disturbed during the earth moving stage.

Any of the tree trunks that were not burned away were placed on the islands in a way to provide a natural looking cover for young plants.

In November 2008, the site was seeded on the island and down the slope of the side of the site. These seeds were raked into the soil.

Botanical Name	Common Name
<i>Achnatherum hymenoides</i>	Indian Rice Grass
<i>Achnatherum parishii</i>	Parish's Needle Grass
<i>Agoseris grandiflora</i>	Giant Dandelion
<i>Argemone munita</i>	Prickly Poppy
<i>Astragalus douglasii</i> var. <i>parishii</i>	Douglas's Rattleweed
<i>Astragalus lentiginosus</i> var. <i>sierrae</i>	Bear Valley Milkvetch
<i>Cercocarpus ledifolius</i>	Mahogany
<i>Chrysothamnus nauseosus</i>	Rabbit Brush
<i>Elymus elymoides</i>	Squirrel Tail
<i>Eriogonum parishii</i>	Mountain Mist
<i>Fremontodendron californicum</i>	Flannel Bush
<i>Juniperus occidentalis</i>	Western Juniper
<i>Mentzelia laevicaulis</i>	Blazing Star
<i>Nama rothrockii</i>	Rockroth's Fiddleleaf
<i>Penstemon grinnellii</i>	Grinnell's Penstemon
<i>Phacelia hastata</i>	Silver Leaf Phacelia
<i>Salvia dorrii</i>	Purple Sage

Nov. 2008 seed mix

During the spring and summer months of 2009, 250 *Penstemon grinnellii* and 50 *Achnatherum parishii* were out-planted onto 2 islands. Drip irrigation was installed prior to planting and to encourage seed growth, sprayers were used instead of individual emitters. In October 2009, *Sphaeralcea* species and *Fremontodendron californicum* were salvaged and directly planted onto the site. Special care was taken to obtain all the soil around the roots, this soil contains the native mycorrhizae fungi which helps the roots obtain valuable nutrients that otherwise cannot be obtained.

In 2010 a watering regiment was established to encourage growth of both the out-planted plants and volunteers. Nursery stock *Chrysothamnus nauseosus* was added to the site on the two islands previously planted. Weeding is done as



needed; predation has not been noted on this site so far. Each island is meeting target goals and overall the entire site is doing very well. The below table is a current list of the species at the Claudia site.

Botanical Name	Common Name
<i>Achnatherum hymenoides</i>	Indian Rice Grass
<i>Achnatherum parishii</i>	Parish's Needle Grass

<i>Argemone munita</i>	Prickly Poppy
<i>Astragalus lentiginosus var. sierrae</i>	Bear Valley Milkvetch
<i>Cercocarpus ledifolius</i>	Mahogany
<i>Chrysothamnus nauseosus</i>	Rabbitbrush
<i>Elymus elymoides</i>	Squirrel Tail
<i>Eriogonum parishii</i>	Mountain Mist
<i>Eriogonum saxatile</i>	Rock Buckwheat
<i>Fremontodendron californicum</i>	Flannel Bush
<i>Juniperus occidentalis</i>	Western Juniper
<i>Mentzelia laevicaulis</i>	Blazing Star
<i>Penstemon grinnellii</i>	Grinnell's Penstemon
<i>Phacelia hastata</i>	Silver Leaf Phacelia
<i>Pinus monophyla</i>	Pinyon Pine

Species Claudia site

The 2011 year proved to be a challenging one for the site. Installed irrigation lines, and fittings were stolen from the site. The irrigation water tank supply was dumped. Fortunately the weather was mild and existing vegetation continued to thrive with the limited water supply, however there was very little new volunteer plant growth.

White Knob Quarry Explosive Area

The White Knob Quarry Explosive Area (WKQE) is on BLM land and it was determined to re-vegetate the site. Baseline vegetation studies were conducted around the site to determine the number and type of species needed for the site. Seed mix and

nursery stock planning were also done. The baseline counts were submitted to the BLM to help start the re-vegetation process in July. In November the BLM replied- questioning different issues in the request. Among them were clarification the mine's already approved re-vegetation plan. These answers have been re-submitted to the BLM and we wait to hear back from them.

Weeds

On one of the inspection at Omya with the Forest Service in 2010 it was noticed that the haul road has two highly invasive plants growing along side it; *Cytisus spachianus* (Sweet Broom) and *Tamarix ramosissima* (Tamarisk).

The *C. spachianus* is growing just below marker six on the way up to Sentinel, during the 2010 year three plants were cut back, monitoring and poison will have to be applied. During the storms five more bushes were unburied just up the haul road from the existing plants. The plants were cut down and monitored through out the year, however *C. spachianus* is an aggressive species and flourished after being cut down. A herbicide will be used in 2012.

T. ramosissima bushes were found growing in Crystal Creek and around marker 10. The one at marker 10 was only 2 ½ feet tall and the whole plant was removed. The bushes in Crystal Creek could be considered trees; in 2011 they were chopped down, Remuda Herbicide was applied directly to the cut stump and then covered with black plastic. All branches were hauled away to prevent further contamination. Monitoring will continue to prevent any re-growth of the plant. Through out 2011 and early 2012, no traces of growth have been documented on the cut/removed Tamrisk.

Wildlife

Amboy

Omya's Amboy site is one of five water sources maintained in the South Bristol mountain range. Populations of Bighorn sheep calls these mountains their home



and frequently visit the drinker at Omya's Amboy site (as seen above).

A Boss wildlife drinker and a rain apron were installed by the combined efforts of Omya, Society for the Conservation of Big Horn Sheep and group of helpful volunteers in 2007. The society has named the drinker Brown tank.

In May 2008, a wildlife camera was purchased and installed near the drinker. Wildlife cameras are being use at various water sources through out the desert to document wildlife usage, population diversity, and species diversity. Data is collected monthly and information is incorporated into the GIS sheep project for the whole Mojave Desert. This information helps California Department of Fish and Game (CDFG) determine the number of animals that have not been collared, the general health of the animals, and the number of lambs recruited into the herd. The documentation also covers

all other species that use the drinkers. The information processed into the GIS is frequency of use, duration, both on a daily basis but also on a seasonal basis, and habitat monitoring between different drinker sources. The camera project currently has over one hundred thousand pictures and we have processed over forty thousand of them. A wildlife camera was also installed at Miller's Cabin spring drinker, another wildlife drinker in the South Bristol Mountains.

The wildlife camera and the drinker are monitored monthly. The batteries and camera card changed and downloaded at this time. The water level is noted and the water is screened to remove algae and debris. Supplemental water hauling needs are determined at this time with water hauled in by truck and pumped in over the high wall to the tank. This year water was hauled in five times with an average fill of 700 gallons. An additional location on site for a second drinker is being determined now.

There is a small but growing herd of Big Horn Sheep that live around the mine with all age categories represented here. The California Fish and Game is working with the Society for the Conservation of Big Horn Sheep in creating a map that shows all the individual herd units and the current water sources. The goal of the operation is to establish working pathways through the desert to ensure genetic diversity for the continued welfare of the big horn sheep. Brown tank at Amboy takes on a greater role in this capacity of extending the range of the sheep closer to the next range. Other species noted are turkey vultures, ravens, song birds, bees, and coyotes.

A report was created for Fish and Game highlighting the commitment Omya has to the wildlife at the Amboy site. The information gathered from the wildlife camera plays a crucial part in the report.

In August of 2011, two of SCBS's new wildlife drinker systems were added to a more vehicle accessible site to provide more water, and encourage herd movement. Each tank holds 2300 gallons with a built in drinker box. The drinker design is a low profile that is buried so only the drinker box and manhole are above ground. A wildlife camera was installed to document the system's usage.

In December, SCBS went back out to the mine site and finished up installation of the drinker, prepared the site for and added the rain mat. The rain mat is held down with rocks and will collect rainfall to fill the drinkers. Water will and is being hauled out to fill the drinkers, both the new ones and old one.

Lucerne Valley

Sharing the mountain side with the mines in Lucerne Valley is a population of Bighorn Sheep (*Ovis canadensis nelsoni*). Omya, Mitsubishi Cement Corporation (MCC), and Specialty Minerals (SMI) are helping the CDFG, Forest Service (USFS) and SCBS, gathering information about these sheep to determine herd size, range, and what effect mining has on the Bighorn Sheep.

The first annual Desert Bighorn Collaborative was conducted in September 2006. Topics covered were how could this information be used, what goals can be achieved and who could help correlate the data. The students of the GIS class of VVC had created a working GIS database and map that would be the basis for the data and would help as a resource for the hardware needed for the project. The meeting was a good beginning to assess the resources' available to the project team; those in attendance were CDFG,

USFS, SCBS, Omya, SMI and, MCC mine representatives, JJ Restoration Service, and VVC. The last Collaborative meeting was held in October 10th 2008.

In September 2006 a Bighorn Sheep capture was organized by the CDFG and funded by MCC. The sheep were weighed, measured, blood samples were taken, their ears were clean out, fecal matter collected, and finally they are collared and tagged. The collars used provided useful information pertaining to location points taken by the GPS portion of the collar every four hours and head down or up as it was done. The GPS portions of the collars fell off the Bighorn Sheep after one year and were collected by CDFG and were entered into a GIS data base to better understand range, water needs, and carrying capacity of the habitat.

JJ Restoration Service has been assigned to help CDFG in the collection of pellet samples, mortalities and collar retrieval. In addition, a wildlife camera database project is being established; the collection, interpretation and processing of data into an active GIS program for research in the future.

Omya purchased one wildlife camera and it was installed on the drinker at turn 15. The data collected from this camera was been integrated into the sheep GIS database that is current and ongoing. The Sentinel drinker has a diverse population that visits the drinker- chucker, squirrels, blue birds, chipmunks, deer (males, females, and young), golden eagles, foxes, bears, bighorn sheep (mostly just the males until a male brings over a female), and other song birds. Data showed a large male collecting a female at a drinker on the west side of the mountains a then being with the female two days later at the east end of there range, just the one female out of the female herd.

In February 2009, JJ Restoration Service attended the SCBS annual meeting and presented a PowerPoint to the board members on the habitat restoration efforts of the mines in Lucerne Valley including a credible effort to save Big Horn Sheep, and their habitat. It also explained the wildlife camera project up to that date.

A Sheep Summit is held twice a year. It allows for CDFG, SCBS, and California Foundation for North America Wild Sheep (CA FNAWS), with occasional Forest Service, National Park Service, BLM and Mojave National Preserve representatives, to discuss ways to manage and review all Bighorn Sheep studies, surveys, projects, and problems. Since the 2009 fall meeting JJ Restoration has presented at the summit.

Community Activities

In Lucerne Valley, JJ Restoration Service contacted the local garden club in hopes that they would be interested in growing native plants for out-planting onto re-vegetation sites. A deal



was struck that included the Future Farmers of America (FFA) program, the garden club, and JJ Restoration Service to grow the plants at the Lucerne Valley High School ,

creating an educational experience for the students with monies donated to the FFA program.

On September 27th, there were over 2200 plant bands were planted at the High School, both students and the garden club members had a blast. Some of the students even returned after school to help finish planting. All the seeds, soil, plant bands and boxes were provided by JJ Restoration Service. This formula will allow the students to experience a working relationship between business and community with no cost to the school or the students.

Going forward, the garden club and FFA will have a chance to out-plant the nursery grown plants to sites they see in the mountains around the valley. It is also planned that they will be growing the majority of the re-vegetation plants for the mines in the future.

A presentation was given at the annual High Desert Garden Club District meeting about the planting at the high school. Many of the members were interested in the relationship and the mine's re-vegetation efforts in general.

Conclusion

The high desert is a difficult place to do restoration. The weather is unpredictable, from lows in the teens to highs over a hundred; precipitation varies from four inches to twenty inches a year, however the four inches of rain seems to be more common. Winds blow in the canyons at over a hundred miles an hour shearing off new plantings and taking the top soil with it as it goes, leaving nothing but rocks to work with. But each year we learn a little more, which plants will work, how to break the winds

ferocity with vertical mulch that lasts, how much water is enough to optimize the growth and not simply create an animal buffet. Over all, this is an ongoing working relationship with the soil that creates a habitat for the wildlife.

Omya's support of the wildlife drinkers, the camera project, and their commitment to concurrent reclamation practices, shows a dedication to the environment. The continued use of innovation, balanced with proven experience has given the sites the best chance for a significant recovery. We are very pleased with the effort and accomplishment that Omya has achieved this year and the good practices of wildlife management. Mining must go on and so will Omya's commitment to restoration.