UPPER SANTA ANA RIVER WASH PLAN
SPINEFLOWER WORKING GROUP

MINUTES
August 7, 2014 10:00 AM

PRESENT	**REPRESENTING**
Edith Allen, Ph.D.	University of California, Extension
Jeff Beehler, Ph.D.	SBV Water Conservation District
Daniel B. Cozad	SBV Water Conservation District
Nancy Ferguson, Ph.D.	US Fish & Wildlife Service
Kim Freeburn	CA Department of Fish & Wildlife
Geary Hund	US Fish & Wildlife Service
Tom McGill, Ph.D.	RBF Consulting
Arlee Montalvo, Ph.D.	Riv/Corona Resource Conserv. Dist.

VIA TELECONFERENCE	**REPRESENTING**
Mary Meyer	Dept. of Fish &Game
Kai Palenscar, Ph.D.	US Fish & Wildlife Service

OTHERS IN ATTENDANCE	**REPRESENTING**
Erin Berger	SBV Water Conservation District
Angie Quiroga	SBV Water Conservation District

1. CALL TO ORDER

The Upper Santa Ana River Wash Plan Spineflower Working Group meeting was called to order by Jeff Beehler at 10:00 a.m. in the offices of the San Bernardino Valley Water Conservation District, 1630 West Redlands Boulevard, Suite A, Redlands, California.

2. WELCOME AND SELF-INTRODUCTIONS

Those present introduced themselves.

3. WASH PLAN HCP: HISTORY AND STATUS

Jeff Beehler gave a brief explanation of the Wash Plan (WP) and noted there is some specific emphasis on spineflower in the HCP. He stated that due to our lack of current knowledge about the spineflower, we have requested your presence here today, to ask for your help with the WP.

Mr. Beehler presented a slide show to bring the attendees up to date on the current status of the WP. He stated the boundaries are roughly east of Alabama Street to the mouth of the Santa Ana river, noting the wash of the river is now included in the WP with Flood Control agreeing to set that ecological process area aside, and northern boundary is about

Greenspot Road which wraps around and is bounded by the river and Alabama. The total area is approximately 4,200 acres. He explained the WP has aggregate mining, water conservation activities, areas set aside for habitat and species conservation and restoration activities. We are addressing the wooly star, San Bernardino kangaroo rat (SBKR), slender-horned spineflower, gnatcatcher and we have added the cactus wren. The wren is not currently on the Endangered Species list but there is belief the cactus wren has a high probability of being added within the next 30 years, the duration of this HCP. He noted compared to the previous version of the HCP, there is less mining and the water conservation basins are smaller. This allows for more habitat conservation and restoration areas. The WP will now include more conservation and management, more detail on the covered species, habitat types, and covered activities with all the information located in one geodatabase. There is also much more detail in habitat management planning. Mr. Beehler explained this planning showed how little is known about the spineflower and why this meeting was necessary. Tom McGill described areas within the WP that support populations of spineflower. The 1938 and 1969 blowout and donut hole areas both with in excess of 500 plants and some small areas to the southeast. On the west side along Orange Street are quite a few sightings as well. Some historic sightings were just north of Plunge Creek. The spineflower population in the middle of the aggregate mining pits is a contingency parcel that could be later open to mining in the future if we are successful with maintaining current spineflower populations and establishing new ones.

4. SLENDER-HORNED SPINEFLOWER: BIOLOGY AND ECOLOGY

Mr. Beehler noted one biological objective for the HCP is designated just to the spineflower: To develop a robust, science based experimental program to address issues unique to the maintenance and enhancement of existing slender-horned spineflower populations and the potential establishment of new ones with in the conserved areas of the WP area. We want to figure out where it is and figure out where we can establish new populations. A lot of our spineflower population is located in a 50 year mining area. That area, wanted for its aggregate, would be eligible for mining if the spineflower can be established somewhere else. We have the following questions:

- Why is spineflower distribution so limited?
- Is this a crytogammic soil exercise?
- Can spineflower be propagated?
- How do we expand existing range?
- How do we know if we're successful?
- Are there ways to improve existing habitat?

Edith Allen asked about the eight known locations in the southern California region as of 1995 and if they are covered in the HCP. Two locations, Cone Camp and Orange Street, are within the WP HCP boundaries, representing a quarter of the known spineflower populations. Some data were collected on spineflower within the wooly star preserve in 2010 for the Army Corps. Mr. Beehler clarified the wooly star preserve is a large HCP that will ultimately be an HCP inholding within the WP HCp. It is labeled on the maps as

WSPA. Mr. McGill stated survey has been done over the last four years within the plan area and it is mapped in GIS layers and some small technical write-ups.

Ms. Allen stated when they did their spineflower study they looked at soil texture, pH, electrical conductivity (EC) and soil nutrients. The sites occupied with spineflower had a certain range of sand, silt and clay pH and EC. They did not have an extremely high number of invasive species and from the distribution standpoint, based on Yvonne Wood's geomorphic survey; they had to be on alluvium that was several hundred to a thousand or more years old. It couldn't be on recent alluvium because an annual plant doesn't withstand that much scouring, but for moisture and seed movement, there had to be some occasional flooding to mobilize seed.

Arlee Montalvo reemphasized the importance of ecological processes. For these species, you have to restore the processes that sustain these populations or you've only invented a temporary solution. Daniel Cozad stated since the dam prevents overflow and scouring, if we can't recreate the natural processes, our question is how can we recreate the processes in a way that supports our spineflower goals? We do have some areas in Mill Creek where the basins overflow and create crytogammic soil which may be hopeful for spineflower habitat. Ms. Meyer believes we need to look at the present moment, the foreseeable future and the long term.

Ms. Allen noted the typical spineflower soil conditions from her 1995 study: a silt loam with a slightly acidic pH, low electrical conductivity (low salinity), .04% total nitrogen, 4 ppm available phosphorus, and less than 1% organic matter. The variance of these values was very tight. This soil was found in seven of the eight known locations. Spineflower needs these very narrow conditions.

Nancy Ferguson explained two scales of management are being discussed and two different concept approaches: long term sustainability and ecosystem parameters and what type of management can be done in the WP. Even before the dam was put in there was no real scouring flow. There is not enough to create habitat. Mill creek brings a lot of sediment and a lot of water, but it does not go up slope across the wash plan boundaries. Trying to get water in that break out channel with Seven Oaks Dam and Mill Creek being down cut is very unlikely. Mr. Cozad agreed unlikely, but not impossible after seeing the previous weekend storm. Mr. Beehler added that heavy equipment could be used to create these flows where necessary.

Ms. Meyer explained it's not just about the water though. Mr. Hund agreed we need some overtopping to have sheet flow over some areas but it needs to be more carefully engineered in how we direct the water because the spineflower needs sediment deposited but SBKR needs it removed. These can appear to be contrary management objectives.

Ms. Ferguson noted the north half of section 12 on the maps near Mill Creek is not good habitat for spineflower. The north section is mature chaparral. There would have to be an engineered solution to have spineflower populations established there. She stated the best

aggregate is also the material that supports spineflower. Getting flow there is a short term management action, but it doesn't address soil characteristics required for the species.

Ms. Allen found in her study that just 10 and 100 meters away the soil can be different enough spineflower won't grow there. Geomorphic processes are going to be important to maintain these open sites. Another concern for spineflower is anthropogenic nitrogen deposition. This area currently gets 20-30 kg/ ha per year. Invasive grasses grow especially well in these high nitrogen areas. It's important to maintain early successional silty sites before more organic matter accumulates for the atmospheric nitrogen to adhere to. It was suggested to take samples before and after storms or sheet flows to see if the nitrogen is leaching sufficiently from the soil. Ms. Meyer believes the spineflower is not well adapted to the current weather regime and it is vulnerable to hot conditions found in the San Bernardino Valley floor. Other populations are found in more moderate temperatures. This population is probably not producing or dispersing many seeds.

Discussion of how the seeds fall out of the involucre, but don't always germinate under wet conditions ensued. A spineflower seed bank, once established, can remain in the soil for decades and only a portion germinate when narrow environmental conditions are present. Spineflower are very plastic in their growth habit. Seeds will germinate readily in response to moisture. However, even if you keep them moist, if the temperature is too hot, they won't grow. When flowering is triggered, frequently the smallest plants are the most productive. The larger ones, which had the most moisture, will go into a vegetative growth period and get very large. They need a stress trigger to change from vegetative to set seed.

Ms. Meyer believes it is most important to begin working on the edges of current populations before trying to create new areas. A tremendous amount of genetically diverse seed obtained from an existing population is needed to see if we can produce a more vigorous individual. Discussion ensued.

It was agreed that simply providing water will encourage more weed growth. So if that strategy is employed, hand weeding may be necessary. Burning as a management tool was not recommended, because it would likely disturb the soil microorganisms. Adding sugar to deplete soil nitrogen limiting the growth of invasive grasses was suggested, but it is only a temporary fix, it would be an expensive yearly task. If you reduce the grass population, the organic matter input into the soil would naturally degrade over time and this would reduce the ability of the silty soils to accumulate nitrogen. Controlling exotic grasses is never cheap, but is probably the most effective management alternative.

Ms. Allen stated the cryptogamic crust is variable from site to site. The two spineflower sites in the WP have some crust present. The seeds may germinate on the crust, but are more successful in cracks in the crust. When exotic grasses invade, crusts usually disappear. Mr. Beehler verified that invasive management is very important in the WP and one of the first tasks will be to get after the invasives around the perimeter of known spineflower populations and where we know there has been historically spineflower. Soil disturbance through raking was discussed regarding redistributing the soil bank of

spineflower seeds, particularly in areas of soil compaction. Success from the soil disturbance may have also been because invasive grass populations were reduced through the mechanical manipulation of the soil. Further discussion suggested that the soil disturbance could bring the seed up higher in the soil profile and with the correct temperature and light, germination could occur. Mr. Hund asked about experimenting with herbicides around the mining sites to get rid of invasive *Vulpia*. Ms. Meyer agreed *Vulpia* was a major problem in spineflower areas. The spineflower seed bank does have resiliency and elimination of invasive grass will allow conditions for germination. Will we get a benefit of knocking down the *Vulpia* over broader areas? We don't have the research to confirm this, but Ms. Meyer believes a soil disturbance experiment is needed as well.

Adaptive research and management will need to be done along the way. Mr. Beehler stated they will try raking, management of invasive plants, and flooding in small scale management experiments.

5. SPINEFLOWER MANANGEMENT AND HABITAT RESTORATION

Mr. Beehler stated there are two topics we wanted to cover: expanding current spineflower habitat and propagating new habitat. Ms. Meyer feels the problem with growing annuals and planting them like nursery stock is that you have removed them from the selective processes that maintain their genetic diversity. Ms. Montalvo suggests starting from plants from existing seed so at least you know you have conditions that can start populations that persist in the area. Moving seeds with the soil may be the most effective. Annuals are hard to transplant. Ms. Meyer stated taking soil that has a seed bank and moving it someplace else has been very difficult and rarely successful. You are also moving all kinds of other seeds, including invasives, as well that are in the soil.

It was agreed sample variations are needed for adequate genetic variation in transplanted populations. Most that collect seeds do not collect more than 5% of the seeds of a population per year, especially for annual species. Seed storage of collected seeds is very important, but we don't currently know what temperature or humidity spineflower seeds need to be stored. Rancho Santa Ana Botanic gardens has a seed storage program and may be able to assist. For assured seed longevity, it is often better to store the seeds in a lab than in the field. Ms. Ferguson illustrated how spineflower can have a lot of vegetative plants one year and not a lot of seed production and vice versa or no seeds at all. In her study, she found it is the combination and cycle of precipitation and temperature that determine the number of seeds produced by a given subset of the population. Genetic diversity of these plants is unusually high for a narrow endemic and rare plant and is likely to select for seed narrowly adapted to various environmental conditions. The plants that did make it and produced seed were the one successful genotype for that year's regime, not genetically diverse at all. Samples need to take into consideration time accounting for seed diversity, depth of soil as well as space. When you are looking at your survey data, you are only looking at presence and absence. In order to

produce a self-propegating population of spineflower, an immense amount of seed would be needed. Mr. Hund feels this increases the argument focus on expanding existing populations first but where we have loss of plants and seed bank from mining, we should at least make an effort to establish a new population through the salvage of seed or soil containing seed. We could harvest seed for a long period time out of this area. Kim Freeburn suggested seed bulking as a strategy to make use of the plant material in the area that will be mined. Discussion ensued. Mr. Cozad suggested since the seeds last a long time, soil manipulation should be attempted to see if some germination will take place. Ms. Ferguson explained spineflower depends on temporal distribution based on seed germination under various environmental conditions, not spatial distribution of the seed.

Kim Freeburn asked for everyone to look for opportunities of a long term endowment to long term research on the spineflower. Ms. Montalvo suggested looking at long term studies/modeling that have been done and contacting the people who have done the studies for information. These studies can show how environmental change/climate change affects plant populations over long periods of time. Mr. Cozad stated District field staff track of rain and temperature already, so they could easily record physical changes, even the micro-environment. Webcams, HOBO data loggers, soil and moisture probes were also discussed as ways to collect environmental data.

6. NEXT STEPS

Mr. Beehler stated what constitutes success of spineflower population expansion would probably need another meeting as part of the HCP implementation process. We have enough information and insight to address initial habit management issues of the HCP. We would like additional help from the attendees today on part of the work plan, especially research protocols. Success criteria will need to be developed if we are to address the "spineflower island".

7. ADJOURN MEETING

There being no further business, the meeting was adjourned at 1:30 p.m.