Implementing Climate-Smart Restoration along California's Central Coast

Climate-Smart Restoration and Education Summary
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Students, teachers, and community members are key to implementing climate-smart restoration. Involving the community, through students, teachers, and families, has been a successful model for the past 25 years of Point Blue's Students and Teachers Restoring A Watershed Program (STRAW).

In this project, we engaged students, teachers, family members, and local community groups in Santa Cruz, San Benito, and Santa Clara counties. We reached a total of 45 classes, 1112 students, 254 parents and 3 community groups with educational programming and through engagement in habitat restoration. This document provides a summary of the restoration and community engagement efforts with some lessons learned.

Restoration Effort Summary:

- 19 planting days
- 1250 plants
- 5,380 linear feet (1.02 miles) restored (total length of riparian corridor)
- Restored area: 8.6 acres

Restoration Activities:

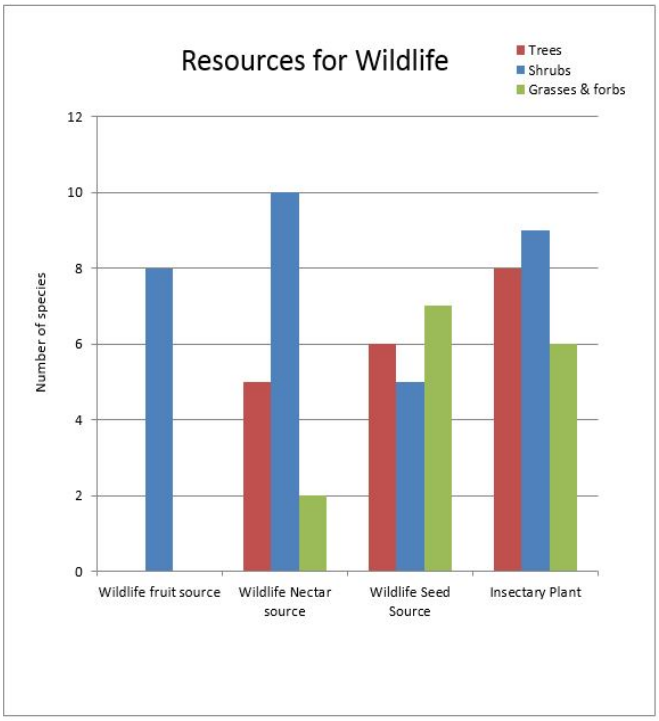
- **Installed 26 species** (8 species of trees, 12 species of shrubs, 6 species of forbs & grasses)
- **Gave special consideration to plant species that enhance habitat for the Least Bell's Vireo** (sought recommendation from Tom Gardali and Kathleen Pollett (USFWS Partners Program Biologist): Least Bell's Vireos need layered canopy extending from 0-15 meters tall, thick foliage density 1-2 meters up from the ground, and a dense understory to carry out the establishment of territory, breeding, and nesting. More specifically, vireo habitat contained these species of vegetation: willows (*Salix* spp.), mulefat (*Baccharis salicifolia*), Fremont's Cottonwood (*Populus fremontii*), and Western Sycamore (*Platanus racemosa*). STRAW incorporated this vegetation into its restoration design plan.
- **Established protocols and practices to prevent impacts to California Tiger Salamander:**
    - Worked closely with US Fish and Wildlife to develop on site protocol for monitoring for the CTS
    - Created educational materials posted on site during planting days
    - We never ended up seeing one!

- **Monitoring**
    - Monitored the project according to the Riparian Zone Monitoring Plan which is a science-based protocol to collect post-project data to further assess agricultural sustainability and ecosystem services.
        - We monitor 3 summers post-vegetation. Monitoring includes collecting vegetation survival data. Each individual plant is evaluated by: 1) alive or not; 2) below or above 3 feet in height; 3) and then assessed for vigor (high vigor = healthy new growth, low vigor = systemic stress, unhealthy). On average, of all surviving plantings, 80.8% exhibit high vigor. Species that exhibit 66.7% or higher in survivability after the third year: *Baccharis pilularis, Symphoricarpus albus, Baccharis salicifolia, Rosa californica, Rubus ursinus, Acer negundo, Quercus lobata, and Leymus triticoides.*
        - We also photo-monitor for 3 summers post-vegetation. Photo-monitoring is a qualitative tool that captures vegetation growth over time from the same GPS photo point.
        - Also conducting bird surveys (every 5 years), and developing a soil sampling protocol for riparian systems that measures water infiltration, bulk density, and carbon sequestered pre and post restoration.
- **Identified challenges and adaptive management in implementing the restoration:**
    - In the last 3 years of this project, the Upper Pajaro floodplain has experienced extreme drought as well as excessive flooding.
        - Drought adaptation: Irrigation installed – water during summer months
        - Flood adaptation: Floods during winter months – newly established saplings were inundated for several days at a time, which contributed to some mortality
        - We experienced a Vole population explosion; mortality due to voles chewing cambium layers and roots
            - Gopher adaptation: Enhanced plant protection with gopher caging
    - Experienced Wild pig presence winter 2016-17
        - Monitoring activity: landowner/farmer on north side of property working on obtaining permitting to be able to shoot pigs, but for now the landowner has had box traps set up to catch individual pigs.
    - Willows and Clay soil
        - Poor draining, fine to medium textured soil – takes a while to drain after storm events – adaptation – plant species that have high tolerance for growing in clay soils and species that do well when temporarily inundated by water
    - Saline Soils: Slightly to strongly saline soils in some sections – conducted pilot planting in 1st year to observe how plants responded. Species planted in the pilot planting responded well, so we ended up using those species (i.e., *Quercus agrifolia, Quercus lobata, Rosa californica,* etc.) as well as incorporated other salt-tolerant species such as *Atriplex lentiformis* (saltbush), *Juncus mexicanus* (Mexican rush), *Acer negundo* (Boxelder), and *Baccharis pilularis* (Coyote brush).

- During the summer, the soil formed cracks creating 1-inch wide crevasses– adapted by using mulch instead of weed mats to fill in gaps, also discourages rodent activity.

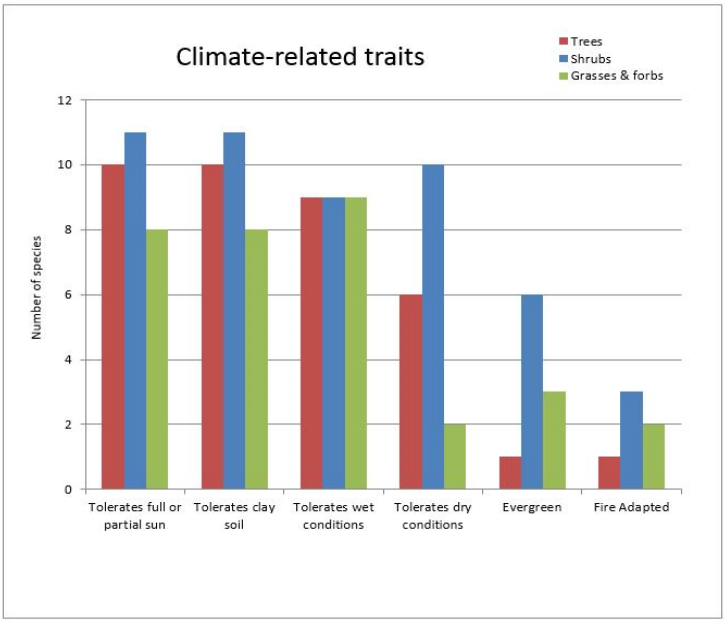
Climate-Smart Design Considerations:

The planting design was developed using the XCEL design toolkit developed through this project. Below are summaries of how the planting design delivered on targets.



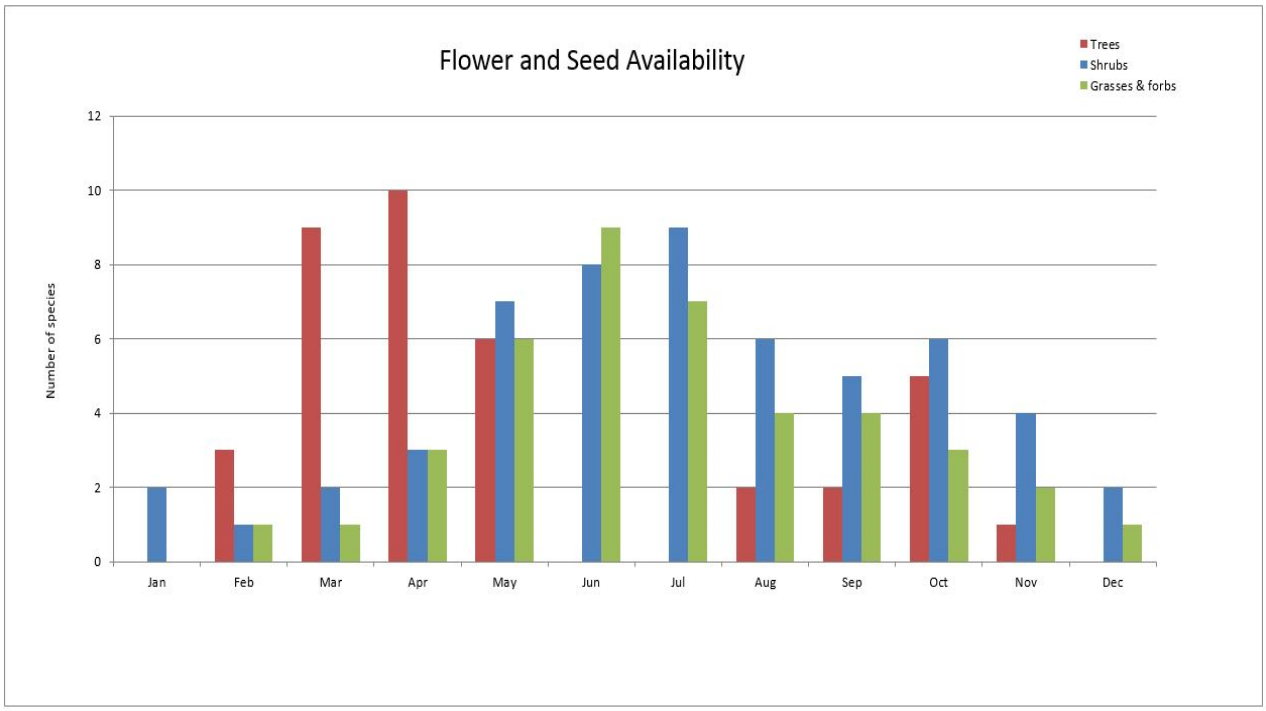
Resources for Wildlife: This chart tells us how many species (of the 26 species planted) provide a wildlife food source such as fruit, nectar, or seeds. For example, 10 species of shrubs in our planting design provide a nectar source for wildlife. Further, 17 species of plants (trees, shrubs, and grasses & forbs) in our planting design provide a nectar source.

Climate-related traits: This chart tells us how many species of the 26 species in our planting design address each climate-related trait. By creating redundancy among species with similar climate-related traits, we are able to reduce the vulnerability of a project to extreme weather events as the climate changes.



Flower and Seed Availability: This chart illustrates that we have incorporated several species of trees, shrubs, and grasses/forbs that provide either a nectar or seed source throughout the year. By selecting

an array of species that flower or seed during different times of the year, we reduce the vulnerability of wildlife to phenological mismatches as climate change can alter flowering and seeding patterns and therefore disrupt food sources for wildlife.



Education Effort Summary

In this project, we engaged students, teachers, family members, and local community groups in Santa Cruz, San Benito, and Santa Clara counties. We reached a total of 45 classes, 1112 students, 254 parents and 3 community groups.

Student Education: Below is a summary of schools, classes, and students reached during the grant period. In addition, a specific curriculum, aligned with Next Generation Science Standards, was created to prepare students for their participation in the restoration and to meet our learning goals. The curriculum consisted of 4 lessons with supporting materials for additional study. It can be found on the project web page on the CA LCC Climate Commons http://climate.calcommons.org/climate-smart-riparian-restoration-curriculum).

School Name	County	# Classes	Grade	# Students
Rucker Elementary	Santa Clara	12	3rd	303
Bradley Elementary	Santa Cruz	10	1st & 2nd	230

R.O. Hardin Elementary	San Benito	16	K, 1st, 4th & 5th	397
Tres Pinos Elementary	San Benito	2	6th	55
San Benito High School	San Benito	1	9-12th	17
Cerra Vista Elementary	San Benito	3	4th	100
Pacheco 4-H	San Benito	1	3rd-6th	10
	Total	**45**		**1,112**

Teacher Education: We invited teachers to attend our annual teacher training, Watershed Week, in August of each year during the grant period. A total of 2 teachers took advantage of this opportunity because we were able to support their travel expenses. In addition, we mentored through small group meetings 34 teachers from the schools we involved. Teachers were asked their teaching goals and interests for this program, enabling us to tailor our curriculum to meet their needs. More specifically, teachers wanted their students to learn about animal and plant interconnectedness within their watersheds, and they were interested in how to align the curriculum to Next Generation Science Standards.

Community Engagement: A total of 200 community members were engaged in the project at Gonzales Ranch. In addition to student's family members, community groups included San Benito High School's Biology Club, the Pacheco 4-H, and San Benito Arts Council. This project also garnered interest from many other groups within the community. Folks from local RCD's, open space districts, USFW, and curious ranchers participated in these planting days, often times working with student groups. Some of the ranchers who participated are now interested in looking into next steps for hosting a STRAW project on their property. Another rancher who was leasing Gonzales Ranch called upon his friends at Agco Hay Company and hosted a BBQ at one of the student planting days!