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EcoAdapt™
Meeting the challenges of climate change

Moving from VULNERABILITY…

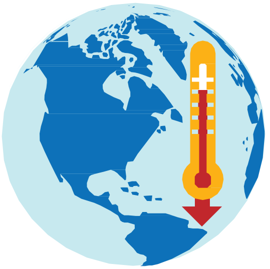
…to ADAPTATION

GOLDEN GATE BIOSPHERE CLIMATE ADAPTATION PROJECT

Defining Adaptation

Climate change adaptation refers to adjustments in natural or human systems in response to changing climate conditions

ADAPTATION STRATEGIES & ACTIONS:



Reduce climate impacts
(sensitivity & exposure)

Increase climate resilience
(adaptive capacity)

Reduce climate change vulnerability

Applying Vulnerability Results to Adaptation Planning

⬇ Sensitivity & Exposure

- Prevent the introduction and establishment of invasive species
- Actively plant drought-tolerant native species in an area projected to get drier
- Reduce stand density to increase tree vigor and structural diversity

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Applying Vulnerability Results to Adaptation Planning

EXPOSURE

- Restore riparian vegetation to limit water temperature increases
- Thin to reduce the threat of sudden oak death on vulnerable sites
- Identify and protect areas of less/slower change (e.g., refugia)

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Applying Vulnerability Results to Adaptation Planning

ADAPTIVE CAPACITY

- Maintain/create migration corridors for native plants/wildlife
- Collect and store seed from rare plants to facilitate persistence and maintain genetic diversity
- Partner with local tribes to expand the use of cultural burning

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Case Study #1: Ojai Community Defense Zone Project

Restoring and expanding a fuelbreak system in Los Padres National Forest

- Increase defensible space within the forest and WUI to reduce the threat of wildfire
- Protect watershed habitat value and water quality
- Create safer conditions for the public/firefighters and increase efficacy/cost effectiveness of fire suppression activities

Case Study #1: Ojai Community Defense Zone Project

STEP 1: IDENTIFYING CLIMATE & NON-CLIMATE VULNERABILITIES

Altered wildfire regimes

- Increases post-fire erosion in severely burned areas, negatively impacting watersheds
- Increases damage/risk within the WUI and resources needed for fighting fires

Increased extreme precipitation events

- Increases flooding and associated erosion in burned areas

Case Study #1: Ojai Community Defense Zone Project


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Stuart Palley for the US Forest Service

STEP 1: IDENTIFYING CLIMATE & NON-CLIMATE VULNERABILITIES

Increased temperatures, changes in precipitation, and more drought

- Dries out fuels and extends the length of the fire season
- Contributes to fast-moving, intense fires during hot/dry periods
- Reduces water availability and the increases distance to water sources used for fighting fires

Case Study #1: Ojai Community Defense Zone Project

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Stuart Palley for the US Forest Service

STEP 1: IDENTIFYING CLIMATE & NON-CLIMATE VULNERABILITIES

Increased invasive grasses

- Alters availability and continuity of fine fuels, contributing to more severe wildfires and altered timing of fires

Increasing human populations

- Increases number of fire ignitions and the number of people at risk during a wildfire

Case Study #1: Ojai Community Defense Zone Project

STEP 2: REDUCING VULNERABILITIES THROUGH EXISTING PROJECT ACTIONS

ACTION: Managing ground cover to result in a mixture of bare ground, grasses, and forbs

- ✓ Removes/controls invasive grasses

ACTION: Use irregular widths, shapes, and patterns in the fuelbreak design

- ✓ Reduces the potential for increased erosion by minimizing the distance that soil can move

Case Study #1: Ojai Community Defense Zone Project


Stuart Palley for the US Forest Service

STEP 2: REDUCING VULNERABILITIES THROUGH EXISTING PROJECT ACTIONS

ACTION: Expanding width of the fuel break

✓ Reduces wildfire rate of spread by decreasing available fuels

ACTION: Using mechanical treatments for fuel removal around dwellings and other occupied buildings

✓ Decreases the risk of ignitions and reduces wildfire rate of spread and potential severity

Case Study #1: Ojai Community Defense Zone Project


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STEP 3: NEW PROJECT ACTIONS TO ADDRESS REMAINING VULNERABILITIES

ACTION: Plant native perennial grasses within the fuelbreak

- ✓ Reduces invasive grass establishment by maintaining dominance of native species, helping decrease flashy fire behavior
- ✓ Increases water infiltration
- ✓ Reduces erosion potential by minimizing bare soil

Case Study #1: Ojai Community Defense Zone Project


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STEP 3: NEW PROJECT ACTIONS TO ADDRESS REMAINING VULNERABILITIES

ACTION: Establish trigger points for recreation closures and restrictions

- ✓ Reduces the number of ignitions by minimizing the number of humans in the area during high-risk times

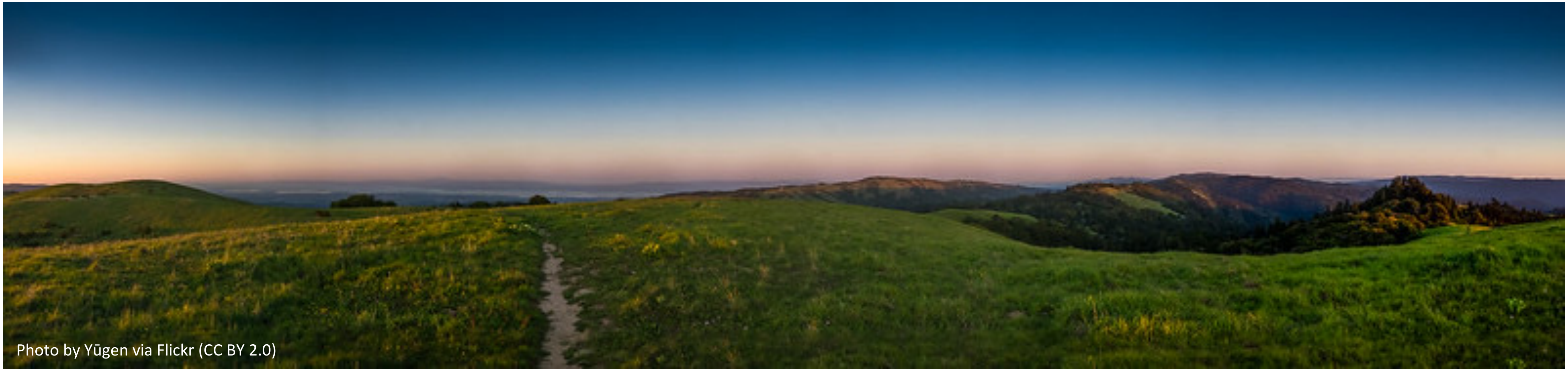
ACTION: Install emergency grey water systems in ‘safety zones’

- ✓ Provides nearby water for fighting fires

Case Study #2: Midpeninsula Regional Open Space District

Used vulnerability information and maps produced as part of the **Santa Cruz Mountains Climate Adaptation Project**

- Inform land management on Midpen preserves
- Support collaborative, regional management efforts by the greater Santa Cruz Mountains Stewardship Network

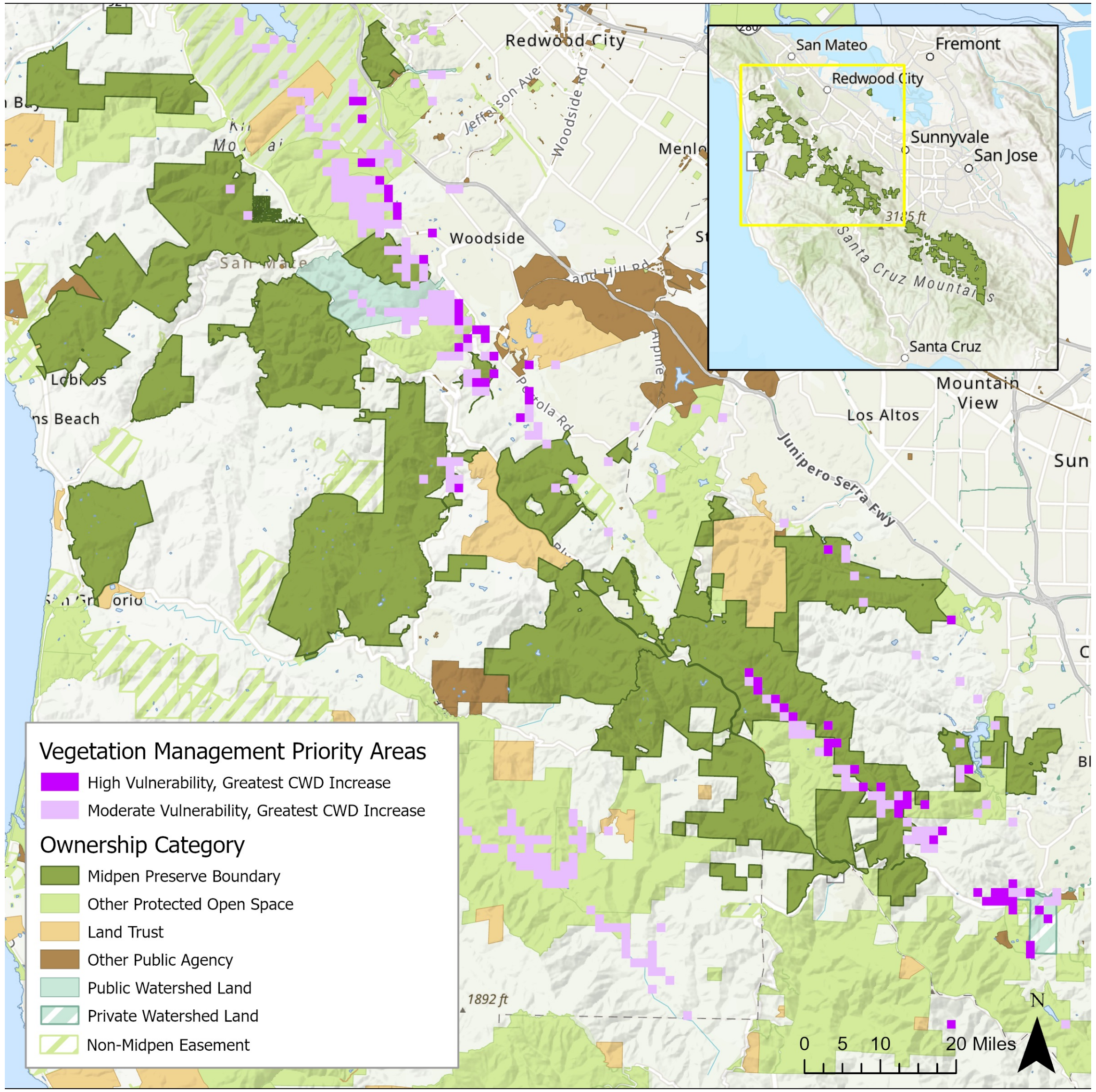


Case Study #2: Midpeninsula Regional Open Space District

Highest projected increases in climatic water deficit (CWD)

and

Areas where vegetation approaching or already past the 95th percentile of the CWD range it can tolerate

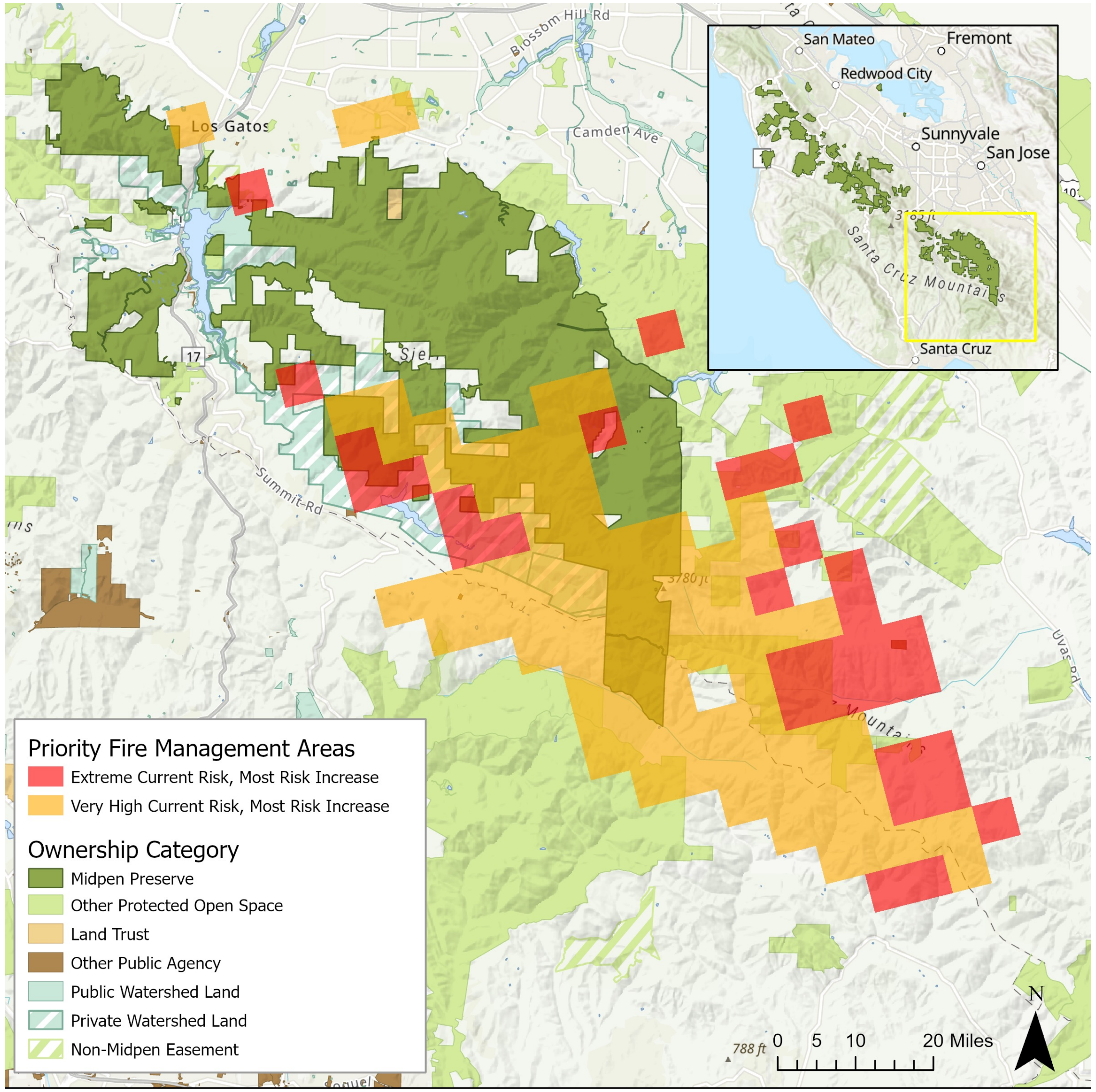


Case Study #2: Midpeninsula Regional Open Space District

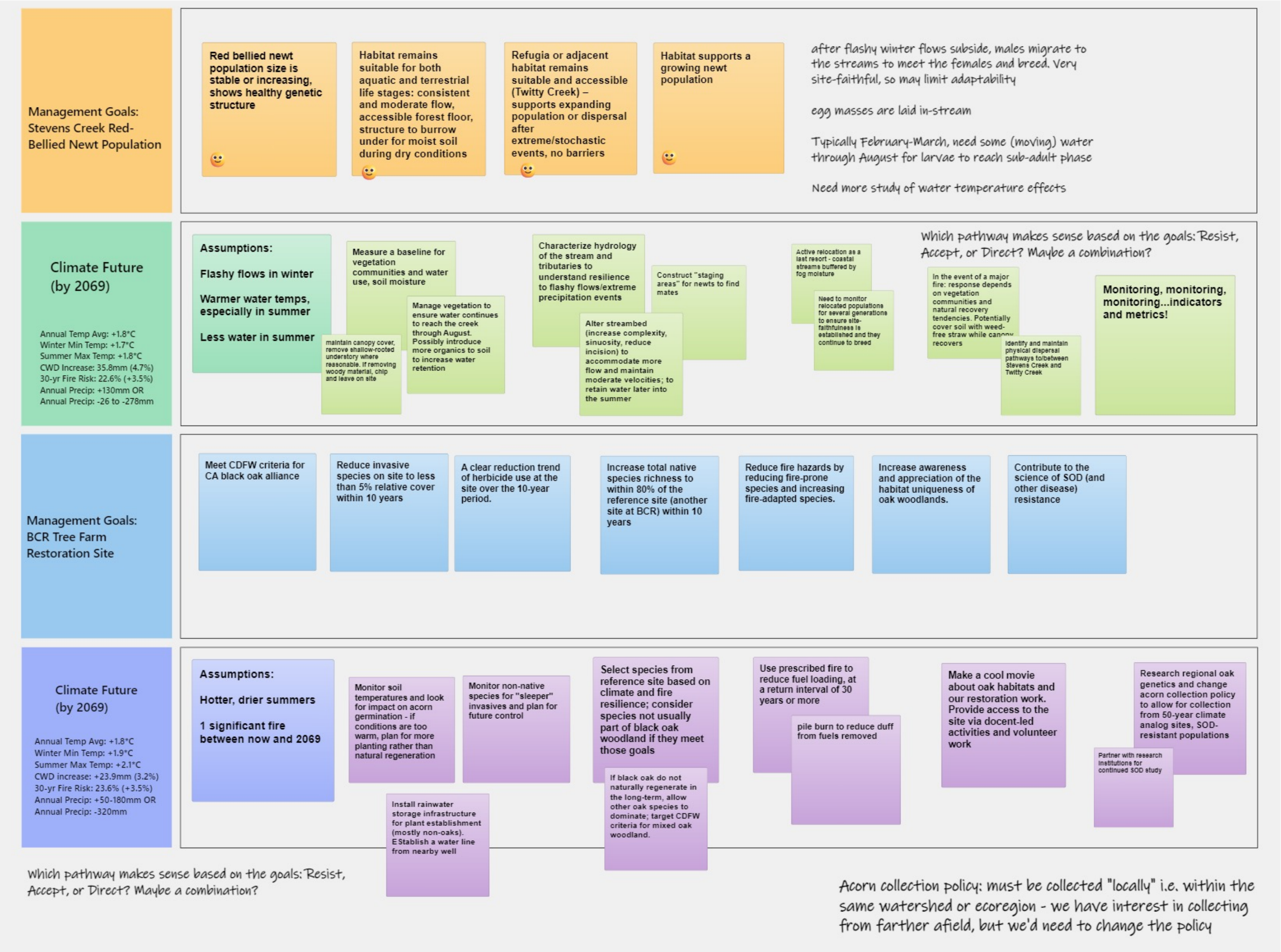
Highest projected increases in fire risk

and

Areas where current fire risk is already very high or extreme



Case Study #2: Midpeninsula Regional Open Space District



Scenario planning to identify actions that would help reach restoration goals under future climate conditions:

- Stevens Creek Red-Bellied Newt Population
- BRC Tree Farm Restoration Site

Case Study #2: Midpeninsula Regional Open Space District

Management Goals: Stevens Creek Red-Bellied Newt Population

Red bellied newt population size is stable or increasing, shows healthy genetic structure

Habitat remains suitable for both aquatic and terrestrial life stages: consistent and moderate flow, accessible forest floor, structure to burrow under for moist soil during dry conditions

Refugia or adjacent habitat remains suitable and accessible (Twitty Creek) – supports expanding population or dispersal after extreme/stochastic events, no barriers

Habitat supports a growing newt population

after flashy winter flows subside, males migrate to the streams to meet the females and breed. Very site-faithful, so may limit adaptability

egg masses are laid in-stream

Typically February-March, need some (moving) water through August for larvae to reach sub-adult phase

Need more study of water temperature effects

Climate Future (by 2069)

Annual Temp Avg: +1.8°C
Winter Min Temp: +1.7°C
Summer Max Temp: +1.8°C
CWD Increase: 35.8mm (4.7%)
30-yr Fire Risk: 22.6% (+3.5%)
Annual Precip: +130mm OR
Annual Precip: -26 to -278mm

Assumptions:

Flashy flows in winter

Warmer water temps, especially in summer

Less water in summer

Measure a baseline for vegetation communities and water use, soil moisture

Manage vegetation to ensure water continues to reach the creek through August. Possibly introduce more organics to soil to increase water retention

maintain canopy cover, remove shallow-rooted understory where reasonable. If removing woody material, chip and leave on site

Characterize hydrology of the stream and tributaries to understand resilience to flashy flows/extreme precipitation events

Construct "staging areas" for newts to find mates

Alter streambed (increase complexity, sinuosity, reduce incision) to accommodate more flow and maintain moderate velocities; to retain water later into the summer

Active relocation as a last resort - coastal streams buffered by fog moisture

Need to monitor relocated populations for several generations to ensure site-faithfulness is established and they continue to breed

Which pathway makes sense based on the goals: Resist, Accept, or Direct? Maybe a combination?

In the event of a major fire: response depends on vegetation communities and natural recovery tendencies. Potentially cover soil with weed-free straw while canopy recovers

Identify and maintain physical dispersal pathways to/between Stevens Creek and Twitty Creek

Monitoring, monitoring, monitoring...indicators and metrics!

Case Study #2: Midpeninsula Regional Open Space District

Management Goals: BCR Tree Farm Restoration Site

- Meet CDFW criteria for CA black oak alliance
- Reduce invasive species on site to less than 5% relative cover within 10 years
- A clear reduction trend of herbicide use at the site over the 10-year period.
- Increase total native species richness to within 80% of the reference site (another site at BCR) within 10 years
- Reduce fire hazards by reducing fire-prone species and increasing fire-adapted species.
- Increase awareness and appreciation of the habitat uniqueness of oak woodlands.
- Contribute to the science of SOD (and other disease) resistance

Climate Future (by 2069)

Annual Temp Avg: +1.8°C
Winter Min Temp: +1.9°C
Summer Max Temp: +2.1°C
CWD increase: +23.9mm (3.2%)
30-yr Fire Risk: 23.6% (+3.5%)
Annual Precip: +50-180mm OR
Annual Precip: -320mm

Assumptions:

Hotter, drier summers

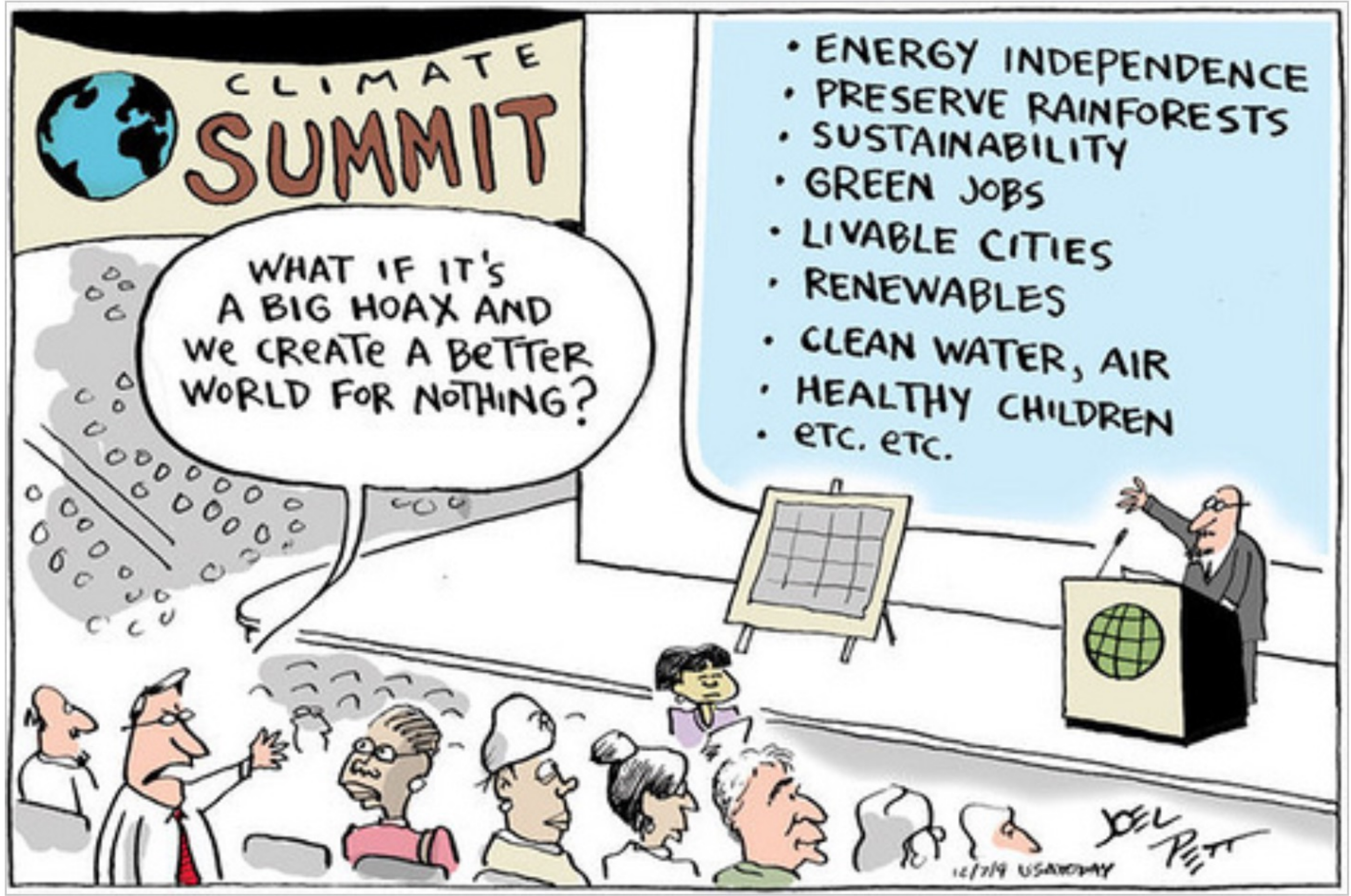
1 significant fire between now and 2069

- Monitor soil temperatures and look for impact on acorn germination - if conditions are too warm, plan for more planting rather than natural regeneration
- Install rainwater storage infrastructure for plant establishment (mostly non-oaks). EStablish a water line from nearby well
- Monitor non-native species for "sleeper" invasives and plan for future control
- Select species from reference site based on climate and fire resilience; consider species not usually part of black oak woodland if they meet those goals
- If black oak do not naturally regenerate in the long-term, allow other oak species to dominate; target CDFW criteria for mixed oak woodland.
- Use prescribed fire to reduce fuel loading, at a return interval of 30 years or more
- pile burn to reduce duff from fuels removed
- Make a cool movie about oak habitats and our restoration work. Provide access to the site via docent-led activities and volunteer work
- Research regional oak genetics and change acorn collection policy to allow for collection from 50-year climate analog sites, SOD-resistant populations
- Partner with research institutions for continued SOD study

Which pathway makes sense based on the goals: Resist, Accept, or Direct? Maybe a combination?

Acorn collection policy: must be collected "locally" i.e. within the same watershed or ecoregion - we have interest in collecting from farther afield, but we'd need to change the policy

Questions?



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