POS REVIEW DRAFT

MARIN CONSERVATION LEAGUE

POLICY FOR BIODIVERSITY AS CLIMATE CHANGES

"What is the extinction of a condor to a child that has never seen a wren?"

I. MCL Goal Statement on Biodiversity:

The MCL goal is: *to protect biodiversity on all lands, natural, working and developed in the face of climate change, pollution, and other stressors*.

It is important to identify ways to advocate for actions to preserve biodiversity while at the same time protecting human habitation in climate changing times.

II. Objectives

Marin Conservation League is committed to the following objectives:

A. Protect Marin's native species and habitats, especially rare, unique, endangered and threatened species, and other species of special concern.

B. Promote a landscape-scale, long time-horizon approach to planning for biodiversity conservation, both Marin-wide and region-wide. Think beyond borders.

1. Promote partnerships and collaboration among agencies, other non-profits, landowners, and biodiversity researchers within Marin and region-wide and assist them as possible to:
    a. Assess the baseline condition of Marin's natural areas as well as working lands, wildlife, wildlife habitat, ocean health, watersheds and wetlands, and other natural systems.
    b. Ascertain likely impacts of climate change on selected native species and habitats, by conducting vulnerability assessments and model simulations.
    c. Ensure ongoing stewardship of public lands and encourage stewardship on private lands to retain existing biodiversity.
    d. Identify and work to establish resilient wildlife and habitat corridors – connecting lands under different public and private ownership – to enable migration of species and habitats in adapting to effects of climate change.
    e. Prioritize where and what biodiversity to conserve under a "resist – accept – (attempt to) direct decision framework.
    f. Implement promising, innovative adaptation methods when possible, and learn and spread what works elsewhere; while Marin is small in size, it can magnify its impact on conserving biodiversity
    g. Expand fire mitigation practices that improve or at least conserve biodiversity and ecological value

h. Expand education to Marin's residents about MCL policy on biodiversity and climate change

III. Policy recommendations and organizational positions:

1. Support the State of California and state and national organizations and landowners who have committed to protecting 30% of US lands and water bodies by 2030, and recognize the importance of the 30 + 70 ethic, prioritizing high-quality conservation of biodiversity, as in the following:
    a. Restore biodiversity of forests, grasslands, wetlands, oceans, and wildlife habitats in general, and specifically where wildfire, hydrologic malfunction and sea-level rise most threaten these ecosystems.
    b. Encourage expansion of Marin's protected open space, and in developed areas, limit new development to infill sites.
    c. Support the efforts of private landowners to conserve natural areas as well as working landscapes that provide ecosystem services, and increase financial incentives for private land conservation.
    d. Support protection and enhancement of biodiversity in urban and suburban areas by encouraging the adoption of the 70% native plant species threshold in landscaping.
    e. Conserve genetic variability, for example through connectivity: land bridges and corridors can improve genetic health by allowing species populations adequate home range and the ability to shift ranges where needed.
    f. Conduct vulnerability assessment for selected species at the regional scale and as a joint effort with other agencies.
    g. Conserve unprotected intact natural areas that are key opportunities for easements or other forms of protection.
    h. Acknowledge that rarity of species can be due to numerous natural and anthropogenic conditions, and analyze how these may affect tolerance to the effects of climate change.
2. Assess natural resources and monitor their condition over time.
    a. Better understand what past ecosystems looked like, and how they have changed due to past climate change, fire, and human settlement
    b. Using finer scale vegetation mapping (note recent County-wide vegetation mapping), inventory and subsequently monitor current ecosystems to understand how they may be changing over time.
    c. Review model simulations of plant community changes under various climate scenarios and support funding for additional modeling, both for Marin and the region—these are best-guesses about what future biodiversity might look like.
    d. Identify where species likely will migrate to and migrate from.
    e. Identify highest priority land and water areas for conservation of biodiversity of the associated wildlife and plants that live there. Identify sacrifice areas and

associated species. Prioritize what we want to save; we can't possibly save everything and need to go into climate change with eyes wide open (See NPS's Resist, Accept, Direct model)

f. Define practical indicators or surrogates for "success" in conserving biodiversity, and then implement conservation actions and monitor over time.

g. Advocate for grant funding for scientific study of wildfire resiliency, perhaps modeled after the Marin Community Foundation's "adaptations to sea level rise" grants, enabling the development of innovative ecological solutions and scientific approaches for large-scale vegetative fuel reduction.

h. Identify areas of climate refugia – locations that may be more stable under climate change. Recognize that biota appearing to be common now could become endangered by a changing climate, and direct efforts toward conserving communities or ecosystems as future legacy zones.

i. Collect whatever species and genetic varieties are necessary to ensure a record for future needs that we don't know yet.

j. Identify and implement a seed banking approach to protect selected members Marin's diverse flora, in conjunction with regional and state-wide efforts.

3. Continue and expand stewardship of natural areas to maintain existing biodiversity

   a. Increase invasive plant control programs across jurisdictional boundaries.

   b. Use wildfire fuel reduction techniques that follow best management practices (including invasive plant control).

   c. Use community science to document baseline conditions so as to better understand climate change impacts.

4. Establish resilient wildlife and habitat corridors.

   a. Identify corridors that can enable habitat types to migrate with a warming climate, toward higher elevations, north aspects, or northerly environments. (Keep or lose my examples here -- For example, as vertebrates of the high Sierra Nevada adapt to a 500-foot elevational rise in freezing levels at elevations above Lake Tahoe, pikas seem resilient enough to adapt to more extreme climate shifts, absent human-made barriers, while Clark's nutcracker populations are forecast to decline with shrinking habitat.) How can we try to predict this and help species to adapt?

   b. Identify connectivity using finer scale vegetation maps.

   c. Understand climate distribution shifts, barriers to connectivity, and differing mobility rates among species as communities adapt to climate change.

   d. Identify where and how assisted migration is the best alternative.

   e. Recognize that different plants with different physiologies may move in opposite directions.

   f. Corridors may not always be a good thing, for example, as a corridor for wildfire and disease spread, and require competing tradeoffs.

5. Advocate for monitoring wildfire risk mitigation practices to assess their benefits to and impacts on biodiversity:

   a. Identify when and where wildfire mitigation practices can achieve improvements in biodiversity, and expand those that improve biodiversity.

   b. ??? Establish a program, such as the wildlife grids in bay area initiated, to look at fire impact on wildlife.

6. Communicate MCL's Biodiversity Policy
   a. Encourage reaching out to and engaging private land owners of working lands in collaborative programs to adapt to climate change.
   b. Utilize the partnership of agencies and the protected park and open space lands within the Golden Gate Biosphere Network to identify migration routes for some species and refuge areas for others that are being impacted by climate change.
   c. Engage citizen scientists and volunteers, such as those in One Tam programs for monitoring assistance.
   d. Encourage communication among scientists and land managers

IV. Background

What is "biodiversity"?

Coined in the mid-1980s and first applied in a publication by E.O. Wilson, biodiversity in its simplest form is a contraction of "biotic" or "biological" and "diversity." The typical response to the question "what is biodiversity?" is that it encompasses genetic diversity, species diversity, and ecosystem diversity. Diversity has long been used by ecologists as a convenient indicator of the well-being of ecological systems. As an ecological measure, diversity consists of two components – variety or richness (number of different species or taxa in a sample and amount of genetic diversity within a species), and abundance (relative number or density of each component species in a sample). Where the purpose is conservation management, conservationists almost invariably equate diversity with species richness as the primary object of interest and sample accordingly. Where the purpose is to monitor change in species or habitats across space or over time, the sampling method generally leans toward measuring abundance.

Since the term biodiversity was coined, it has taken on a life of its own, due in part to the urgent need to address anthropogenic species extinction, and in part to shifting values starting in the 1980s. The initial purposes of preserving biodiversity took on social, cultural, economic, and political significance, shifting from the largely ecological and intrinsic value of saving species to an instrumental one aimed at preserving ecosystem services that sustain all life, including humans, and then to a utilitarian purpose – e.g., to preserve options for future food sources or medicinal properties, for the benefit of future generations of humans.

In 1988, the United Nations set in motion the process to study the need for an international convention on biodiversity, which was written by 1992 and opened for signing at the Earth Summit in Rio de Janeiro that same year, becoming operational in 1993, after being signed by the first 30 countries. It has now been ratified by all but four nations. * Subsequently, a series of international meetings (Conferences of Parties or COP's) has been held to guide implementation of the Convention. Important milestones have been the setting of the Aichi Targets in 2010, which were supposed to be met by 2020 (but were not).

Combining the evolved term "biodiversity" with MCL's mission, and noting that the United Nations Environment Programme has highlighted biodiversity loss as one of the main threats to the future of our planet, * it is MCL's policy goal *to protect biodiversity on all lands, natural, working and developed in the face of climate change, pollution, and other stressors*. It begins with the most common measure of diversity, richness (of native species), and goes on to encompass related qualities, such as variability (in types of organisms), endemism and other rarity factors, ecosystem functions that support a full range of above and below-ground energy flow, nutrient cycling, food web, long term genetic variability and resilience, and ecosystem services for human well-being. It would be a mistake to focus only on species richness, e.g., to rank communities like salt marshes, which are generally species-poor, as somehow inferior, without regard for their distinctive ecosystem functions, their known productivity with net carbon sequestered, and incidence of rare species (an abundance factor).

Biodiversity values in Marin and threats

The San Francisco Bay Area, including Marin, has been recognized for its biological diversity and is considered a hot spot for species richness and diversity within the larger California Floristic Province hot spot recognized by The Nature Conservancy and Conservation International. Marin is also part of a larger Golden Gate Biosphere Network (GGBN) whose boundary extends through Sonoma County and south through San Mateo County. The GGBN

was recognized by UNESCO in 1988 and encompasses over 13 protected areas. These areas all lie within the avian pacific migratory flyway. The extensive plant diversity in this hotspot mirrors the complex parent materials (geology and soils) and diverse microclimates that exist within the overarching Mediterranean climate. Their values of biodiversity also support ecosystem services that range from clean air and water and wildlife habitat, to waste assimilation and nutrient cycling, to pollination and food security, to our health and well-being, such as our pleasure in seeing endangered Coho salmon migrate up stream, watching birds, and visiting monarch butterflies clustering in coastal trees.

The Bay Area's biodiversity faces numerous threats such as habitat loss and fragmentation, land conversion, invasive species, over-recreation, water diversions, pests, pathogens, and more. Climate change creates additional threats to Marin's biodiversity. Increases in greenhouse gas (GHG) emissions from fossil fuel use, especially carbon dioxide (CO2) and methane (NH4) emissions, are increasing temperatures on a global scale, and at a faster rate in some areas, such as the North American Southwest (including California). Prolonged and intense heat waves and drought, intensified wildfires, and sea level rise alter or impair vital ecosystem processes and, among other harms, reduce soil complexity, cause plant and wildlife species ranges to shift or die out and, depending on the tolerances of member species, disrupt community patterns and foodwebs and/or cause them to shift. At the other extreme, prolonged bursts of precipitation from stronger, moisture-laden "atmospheric rivers" can cause flooding, erosion, and other stressors on ecosystems, even if total precipitation remains unchanged.

Marin and California native plant and animal species and their habitats are not newcomers to drought, having adapted over millennia to a Mediterranean climate with a long dry season, and to periodic multi-year droughts. Methods of adapting vary by species and by life stage. Some species:

- Rely on already developed drought-tolerant traits and behaviors (some remarkable!) to survive[1].
- Select for those individuals that already have drought tolerant traits and behaviors
- Develop new drought tolerant traits that can be selected for
- Move/migrate within and among areas: plants, through the agency of wind, water, animals, and humans dispersing seeds and spores; and animals through their own mobility. Some plants and animals move laterally or vertically by altitude, while niche survivors may expand their niche. Wildfires can powerfully accelerate and alter the movement/migration process.
- Those that cannot move or adapt to their site can go extinct in that area.

These are normal biogeographic processes. What's different now is the extent and abrupt pace of change. Past climate changes typically occurred at a geologic pace, slowly enough to give species long response times to evolve/adapt. Not so going forward!

Unlike the past, temperature-driven drought-caused changes in distribution won't be partially reversed by a following, extended period of cooler-than normal temperatures. It is likely that temperatures will only rise or remain the same for the indefinite future.

Projections about impacts of climate change on biodiversity are concerning. One study that simulated Marin plant communities under different heat and precipitation scenarios showed

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stark plant community changes at much elevated average temperature levels.[2] Compared to California overall, Marin's more limited geographical range and microclimatic diversity limits migration possibilities, while habitat fragmentation due to dispersed human development reduces those possibilities everywhere.

V. Management decision models and approaches

A. National Park Service framework

No single model applies to all situations when determining how to manage for biodiversity in natural resources in the face of worsening climate-caused effects. The National Park Service has acknowledged that climate change, whether incremental or sudden, compounds traditional stressors' impacts on ecological systems, thereby precluding return to 'normal' even if those stressors were eliminated.

To address this reality, NPS has adopted a framework to "resist, accept, or direct" anticipated climate-related impacts. ("Resist, Accept, Direct: A Decision Framework for the 21st century." Natural Resources Manager, 2021)[3] For successful conservation, the framework identifies, first, the need for land managers to work at a large landscape scale, across jurisdictions, using a shared decision framework for collaborative discussion. The suggested decision framework is to analyze each project or management action and identify which of three directions is appropriate:

- *Resist* the trajectory of change, by working to maintain or restore ecosystem processes, function, structure, or composition based upon historical or acceptable current baseline conditions;
- *Accept* the trajectory of change, by allowing ecosystem processes, function, structure, or composition to change, without intervention; or
- *Direct* the trajectory of change, by actively shaping ecosystem processes, function, structure, or composition towards desired new conditions.

For example, if "Plant A" is expected to go extinct due to prolonged drought or other extreme patterns, the choices under these scenarios could be: *Resist*: water the plants as necessary; *Accept:* leave the plants alone without attempting to save them; and *Direct*: assist the plants migration by active relocation.

We face tough choices about what to resist, accept and direct. Some advocate strongly that if we direct, we do so with extreme caution, so as to avoid doing more harm than good for biodiversity. Directing is fraught with many unknowns, including effects on population genetic diversity. Research into what helps and what hurts will be crucial.

B. California 30x30 Initiative:

E.O. Wilson originally had used island biogeography theory to calculate that the majority of the species on earth could be saved by preserving 50% of its surface. This led to his book *Half Earth* and the Half Earth Project. Wilson was a strong proponent of the "spare" approach to

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[2] https://www.pepperwoodpreserve.org/wp-content/uploads/2016/05/Climate-Ready-Vegetation-Report-Marin-Coast.pdf

[3] https://irma.nps.gov/DataStore/DownloadFile/654543

conservation, which emphasized parks and preserves. A complementary strategy has been called the “share” approach, which recognizes that lands managed primarily for human benefit can also contribute significantly to preserving other species. Agricultural lands were the first to be included in the “share” approach, but later ecologists recognized the importance of urban and suburban lands in protecting biodiversity as well. * This is especially significant in light of the increasing extent of urban and suburban lands worldwide, and of the need to provide housing for the people living in them. The inclusion of all of these lands as important for biodiversity conservation has led to the new term “30 + 70,” which indicates that we cannot ignore any part of our planet as we confront the global biodiversity crisis.

Doug Tallamy has been in the forefront of efforts to articulate specific recommendations for maximizing the biodiversity value of urban and suburban landscapes. He has found that when proportions of locally native plants drop below 70%, large effects are felt further up food chains, particularly on insects and birds. * The name of his Homegrown National Park initiative indicates that restoration efforts on urban and suburban lands can have impacts as significant as those on preserved lands. The restored urban and suburban areas may also serve as corridors among the protected ones. Furthermore, urban and suburban restoration efforts, by reconnecting people to the species native to the areas where they live and work, may also encourage more enlightened recreation on the preserved lands.

California has adopted ten pathways to preserve 30% or the states lands and waters by 2030 (Pathways to 30x30, 2022):

1. Accelerate Regionally Led Conservation
2. Execute Strategic Land Acquisitions
3. Increase Voluntary Conservation Easements
4. Enhance Conservation of Existing Public Lands and Coastal Waters
5. Institutionalize Advance Mitigation
6. Expand and Accelerate Environmental Restoration and Stewardship
7. Strengthen Coordination Among Governments
8. Align Investments to Maximize Conservation Benefits
9. Advance and Promote Complementary Conservation Measures
10. Evaluate Conservation Outcomes and Adaptively Manage

The additional San Francisco Bay Area climate change effects include:

- Diminishing supplies of sediment necessary to sustain tidal wetlands as sea levels rise
- Wildfires in coastal redwoods and chaparral forests, and resultant air quality issues
- Lack of urban green space and increasing number of days and intensity of extreme heat

The potential nature-based solutions for the San Francisco Bay Area include:

- Conservation and restoration of riparian habitats and wetland habitats, including tidal salt marsh
- Green infrastructure, such as living shorelines that include subtidal habitats and ecotone levees
- Restore system connections and functions, including reconnecting Baylands and uplands

- Use of locally native plants in urban greening
- Manage livestock grazing to maintain and enhance habitat for native species and control reduce fire fuel loads

* McKinney, M.L. 2002. Urbanization, biodiversity and conservation. *BioScience* 52(10): 883-889

*Tallamy, D. 2019, Nature's Best Hope. Timber Press, 254 pp.

*https://homegrownnationalpark.org/

* https://www.cbd.int/history/

*https://www.unep.org/resources/making-peace-nature

C. Conservation Conversations

A collaboration among nine universities is exploring conservation challenges. ("Conservation Conversations: Addressing 21st Century Conservation Challenges to Benefit our People, Economy and Environment," 2020) The collaboration recommends three actions to help protect nature under climate change:

- Reduce the pollution from fossil fuel burning that causes climate change. (The magnitude of climate impacts to biodiversity will depend on the pace of reducing global greenhouse gas emissions. The faster the pace, the smaller the impact on biodiversity and the challenges for adapting to the changes—and vice versa.)
- Use climate change data to prioritize land that improves habitat connectivity for plant and animal species to move as biomes shift.
- Conserve existing refugia, places that may be more stable under climate change.