DESIGN WITH THE WILD:
ACCOMMODATING TULE ELKS AT POINT REYES NATIONAL SEASHORE

BY

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THESIS

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ABSTRACT

On Point Reyes National Seashore, a National Park Service managed land, there are conflicts between local ranchers and signature native species, tule elks. To help mitigate the friction between tule elks and people, this thesis recommends a major shift in attitude concerning management strategies at Point Reyes National Seashore and delivers design interventions that frame the situation more holistically and support a more resilient approach.

Agricultural land has been one type of land-use in Point Reyes for thousands of years. Since the mid-1800s, dairy ranching has become the major form of agricultural operations in Point Reyes and Marin County. Local ranchers are still stakeholders within the National Seashore, and the ranching activities are oppressing the survival of the native species. For instance, tule elk (*Cervus elaphus nannodes*), a local native subspecies of elk, was reintroduced into Point Reyes National Seashore in 1978. Tule elk used to range widely in central California, but now it is a protected species at state and federal levels. As the ranches within Point Reyes National Seashore inevitably overlap with the elk distribution area, tule elks are facing habitat loss and competition with ranch animals.

The design proposal in this thesis is tule elk-oriented, but competing interests are taken into consideration. The solution should support elks' survival while maintaining ranchers' land. The deliverables include (1) a catalog of strategies in different scenarios and (2) three site plans demonstrating the application of the strategies. The proposed design interventions can help (a) restore the habitat of the tule elk, (b) address land-use conflicts, and (c) create better recreational experiences for park visitors. Framed as a prototype, the design proposal can also be applied to other national parks where natural and cultural systems are in conflict.

Keywords: Tule elk, Point Reyes National Seashore, Rancher, National Parks, Human-Nature relationship

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1. Research Background

Conflict is a typical form of human-nature relationship when wildlife and humans coexist within one place. As a landscape architecture student and a national park lover, I am always concerned about how we can mitigate the inevitable wildlife-human conflict. Especially in national parks, where people are supposed to enjoy the wilderness and feel more in harmony with nature, friction between humans and wildlifes should be restricted to a minimum level. Among the conflicts, a major one centers on land use. According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), human activities are shifting land cover and landforms, and those have become the major cause of biodiversity loss and ecosystem deterioration.[1] Human activities may contribute to natural disasters, and they are threatening natural resiliency. Many species have lost their habitats and become extinct during the process. Landscape is not only for people; it is also for the wild. However, when land-use conflicts arise, humans always win.[2]

In my opinion, as humans are also part of the global biosphere, to protect other species is to protect ourselves. Humans need to undertake the responsibility not only because we should compensate for the damage we did, but also because we are the only species that has the ability to address the problems. Landscape architects are capable of proposing design interventions to mitigate conflicts and help shift human activities to benefit other species' survival. While this thesis focuses on accommodating tule elks at Point Reyes National Seashore, my larger aim is to provide a design prototype aimed at supporting healthier human-nature relationships and to encourage further study thereof.

[1] "IPBES Global Assessment Report," World Wildlife Fund for Nature, accessed April 14, 2020, https://lp.panda.org/ipbes.

[2] Rosenzweig, Michael L. Essay. In *Win-Win Ecology: How the Earth's Species Can Survive in the Midst of Human Enterprise*, 9–9. Oxford: Oxford University Press, 2003.

2. Site Selection

Based on my own research interests, I chose Point Reyes National Seashore since it satisfies most criteria of my ideal site: The ideal site should be rich in biodiversity with high value species that deserve special protection. As represented in Figures 1 and 2, the West Coast, East Coast, and southeast Mississippi watersheds belong to an internationally important bio hotspot. Additionally, the ideal site should support a high intensity of human-wildlife interactions, so a higher level of conflict between humans and wildlife would be likely. Thus, semi-urban areas, where abrupt interfacing between developed and natural areas is typical, are preferred. Existing national parks are ideal candidates for my site selection because most of them are rich in biodiversity and have to endure high pressure of human disturbance. Point Reyes National Seashore is an existing National Park Service managed park located on the California coast near the San Francisco Bay Area. It is within the range of international bio hotspots and has to interface with a large population of visitors from the cities around it, which meets all the conditions of an ideal site discussed above.

Figure 1. National Parks Areas and Imperiled Species Richness in the United States, map by author

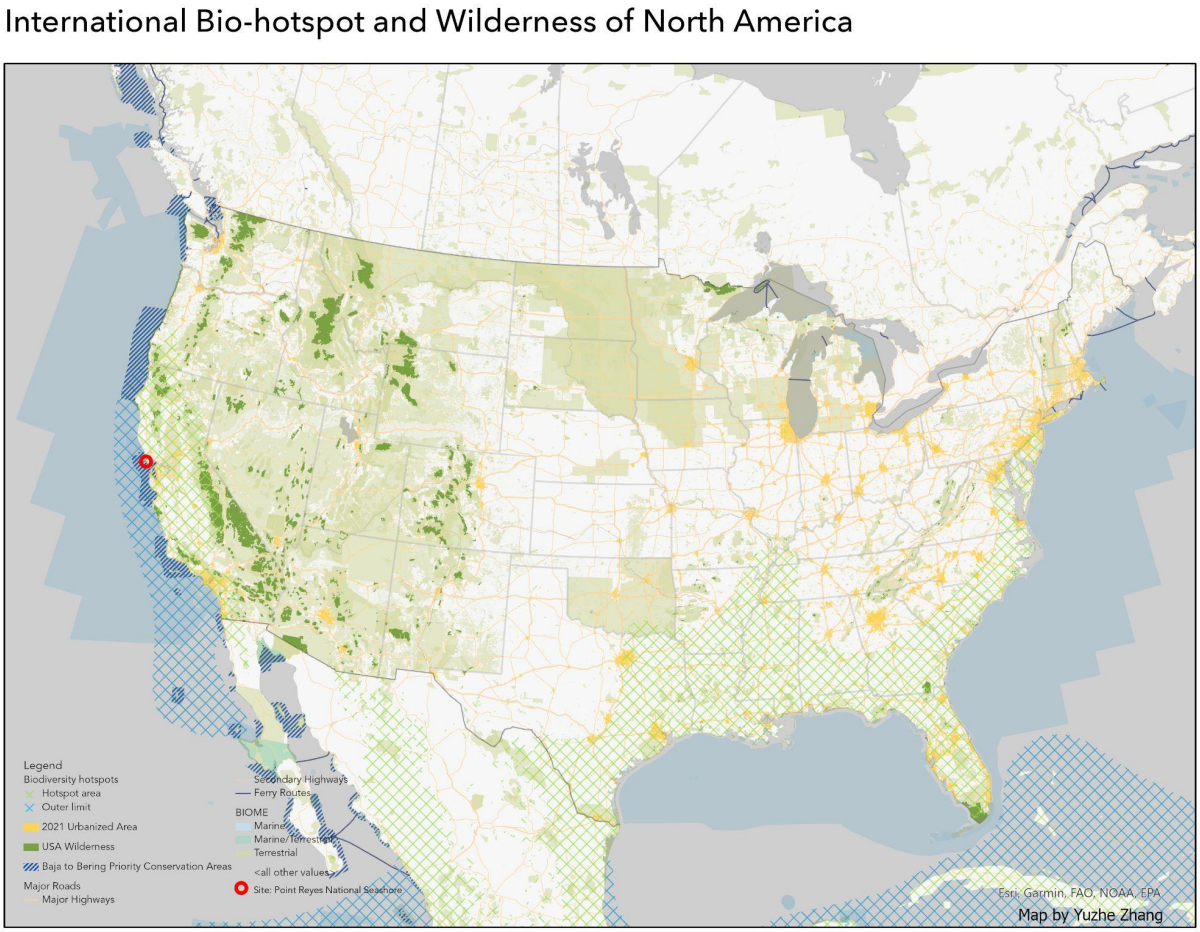

Figure 2. International Bio-hotspots and Wilderness in North America, map by author

Another unique fact about Point Reyes National Seashore is that part of its land is managed by local ranchers. The ranchers are local stakeholders, and they operate ranching within the National Seashore. Some of the ranch overlaps with wildlife habitat, including that of tule elks, and it is also not accessible to visitors, as if private land. Therefore, a wicked problem of competing interests conditions this place. That includes three areas of conflict: (1) between ranchers and tule elks, since ranching takes over habitat areas, and elks also compete with ranch animals; (2) between ranchers and visitors, because of lack of accessibility in a National Park, and (3) between visitors and tule elks, as intense disturbance from humans can have negative impacts on elks, and elks may also hurt people. The core issue among the conflicts is a struggle between ranching and the survival of local wildlife. I selected the tule elk as the target species of

my research, and my design focuses on problems of tule elks in that place, as discussed in detail in chapter 5.

3. Research Goals and Methods

This research aims (1) to articulate a convincing argument in support of an alternate approach to ranching within Point Reyes National Seashore, (2) to provide suggestions for a new management plan for Point Reyes National Seashore, (3) to deliver design proposals aimed at mitigating conflicts, (4) and to appeal for further discussions about human-nature relationships in related contexts.

The methods of my research on Point Reyes National Seashore comprised several steps (Figure 3). The first step was a literature review focusing on "landscape architecture," "design," and "National Park." By analyzing the pros and cons of precedent projects and theories, I delivered my own view of issues at Point Reyes National Seashore and explained proposed strategies through design interventions. I also focused on the connection of theories of nature to diverse landscape design strategies so that my ideas and design prototype could be more easily applied to further studies of national parks. The next step was site analysis. The long-distance part of that research included background information such as climate status, local human activities, specific issues of local species (tule elks), etc., conducted by searching online and consulting the National Park Service. The field work part of my site analysis included habitat status inspection, tracking and observation of local species, and photographs. GIS-based analysis was performed to understand the landscape architectonic aspects such as current land use.

As the research goal is to provide a design prototype, I wanted to identify a meaningful problem within contemporary national parks that is suitable for redress through design interventions. Thus, I mainly focused on news, history and issues sections and on the website of the National Park Service and the open data from Atlas of USGS website and, based on my site selection strategies, I found the ideal site, Point Reyes National Seashore.

The design strategies described in this thesis were developed based on my site analysis, and they follow sustainable design requirements. I focused on the following aspects for design intervention: activity restriction/coordination for humans and

animals, tourist infrastructure, vegetation restoration, and habitat restoration. The prototype is delivered as 25 design interventions keyed to different scenarios at the site. The axonometric drawings were created using the 3D modeling tool Rhino 6, and they were rendered using Lumion. I also chose three smaller sites within Point Reyes National Seashore and provided site plans to demonstrate where and how my design intervention strategies could be applied.

In the discussion section, I assessed the design and discussed the potential of application on a larger scale. I also concluded the design interventions of this prototype for future use in more conditions in national parks, to solve human-wildlife conflicts and more issues of human-nature relationships.

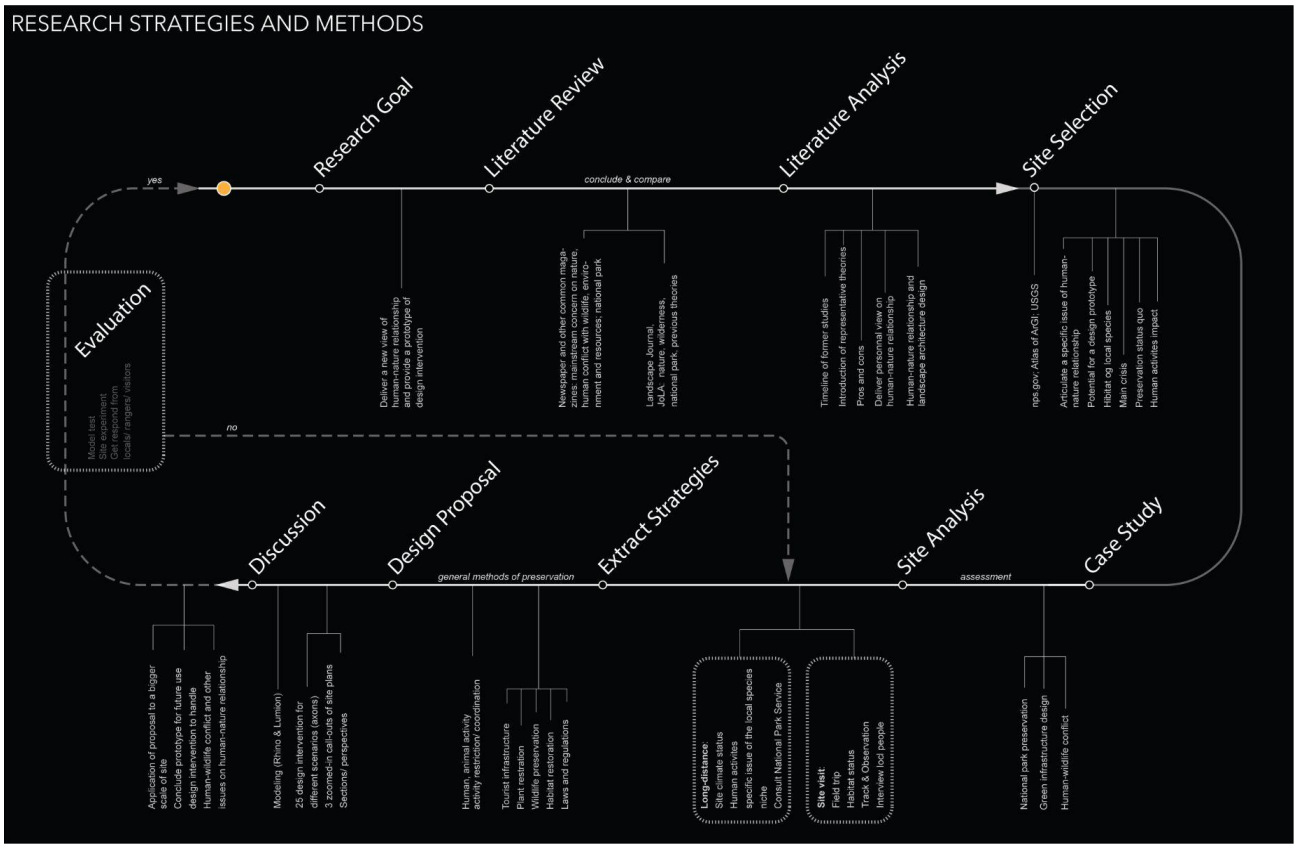

Figure 3. Research Strategies and Methods, drawing by author

4. Site Analysis

4.1. Location and Natural Conditions

Figure 4. Point Reyes Beach, Point Reyes National Seashore, 2022, photo by author

Point Reyes National Seashore is a massive expanse of coastline and park reserve protected by the National Park Service. It is located on the west coast of California in Marin County, near the San Francisco Bay Area. As noted above, Point Reyes National Seashore is within the continuous land of international biodiversity hotspots with an abundance of richness of wildlife varieties, and this condition is determined by multiple factors, especially geographical and climate conditions.

As depicted in Figure 5, the typical climate along the California coast is Mediterranean, and Point Reyes National Seashore belongs to the type of Californian coastal sage chaparral and oakwood in the classification standard of level III ecoregion, which is a type of ecoregion covered by Mediterranean forests, with a mixture of woodlands, and

scrub biome.[3] This ecoregion has dry summers and mild wet winters. The fog and cloud cover provide extra humidity along the coast, including at the Point Reyes Peninsula, and also reduce evapotranspiration, fostering lush plant growth[4] (see misty coastal woodland in Figure 6).

[3] "California Chaparral and Woodlands." Wikipedia. Wikimedia Foundation, July 15, 2021. https://en.wikipedia.org/w/index.php?title=California_chaparral_and_woodlands&oldid=1033711017.
[4] "California Coastal Sage, Chaparral, and Oak Woodlands." bplant.org. Accessed March 22, 2022. https://bplant.org/region/128.

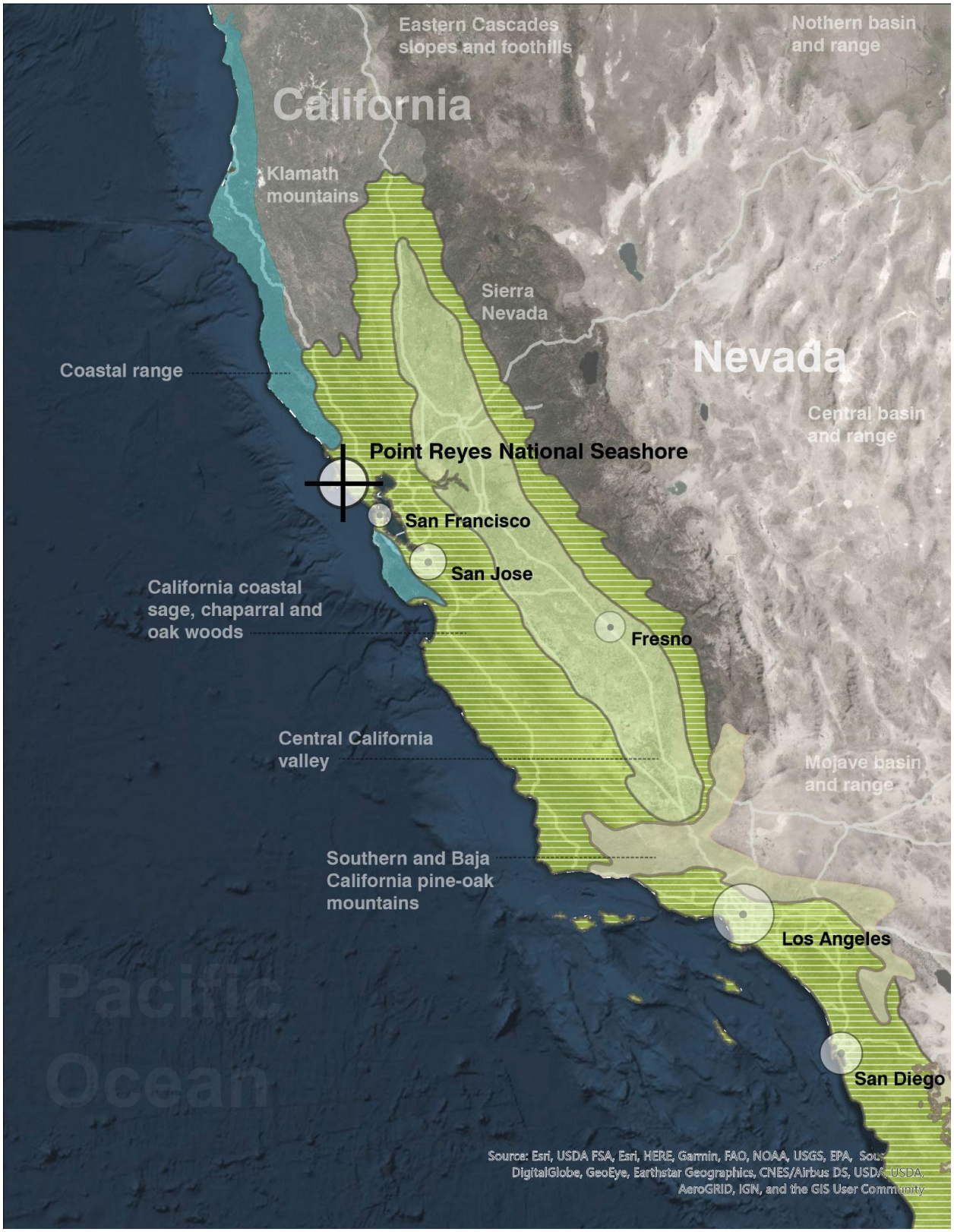

Figure 5. Location of Point Reyes National Seashore and level III ecoregion of North American west coast, 2022, map by author

The Point Reyes Peninsula itself is in the standard of level IV, the ecoregion of the site of Point Reyes and Farallon Island (Figure 7). This is a temperate and humid maritime climate with frequent fog.[5] According to Natural Atlas, species of vegetation like Bishop pine, Douglas fir, coast live oak, coyote bush, and some coastal redwood are common in this area.

Figure 6. Woodland near Limantour Bay, Point Reyes National Seashore and level III ecoregion of North American west coast, 2022, photo by author

The richness of vegetation provides an abundant food source and multiple variants of habitats, which helps different groups of animals thrive and form multiple types of eco-communities with plants. Those eco-communities can be divided into three major categories based on the type of habitat and distance to the coastline, including maritime and coastal grasslands,chaparrals and scrubs, and mixed evergreens and woodland (Figure 8). Typical marine mammals in the vicinity include northern elephant

[5] "Point Reyes/Farallon Islands." Natural Atlas. Accessed March 27, 2022. https://naturalatlas.com/ecoregions/point-reyes-farallon-islands-2767945.

seal, gray whale, harbor seal, and short-beaked dolphin. The land closest to the shoreline is covered by coastal chaparrals and grass, allowing herbivores to thrive. The tule elk (*Cervus canadensis nannodes*) is the unique elk subspecies that can only be found in coastal California. In addition, there are also grazed ranches here, with large amounts of cattle raised by local ranchers. The valley and hills are mainly covered by woods, usually arboreal mixed evergreens, providing habitats for forest animals like birds, bats, deers, and black bears.

Figure 7. level IV ecoregion of Point Reyes National Seashore, map by author

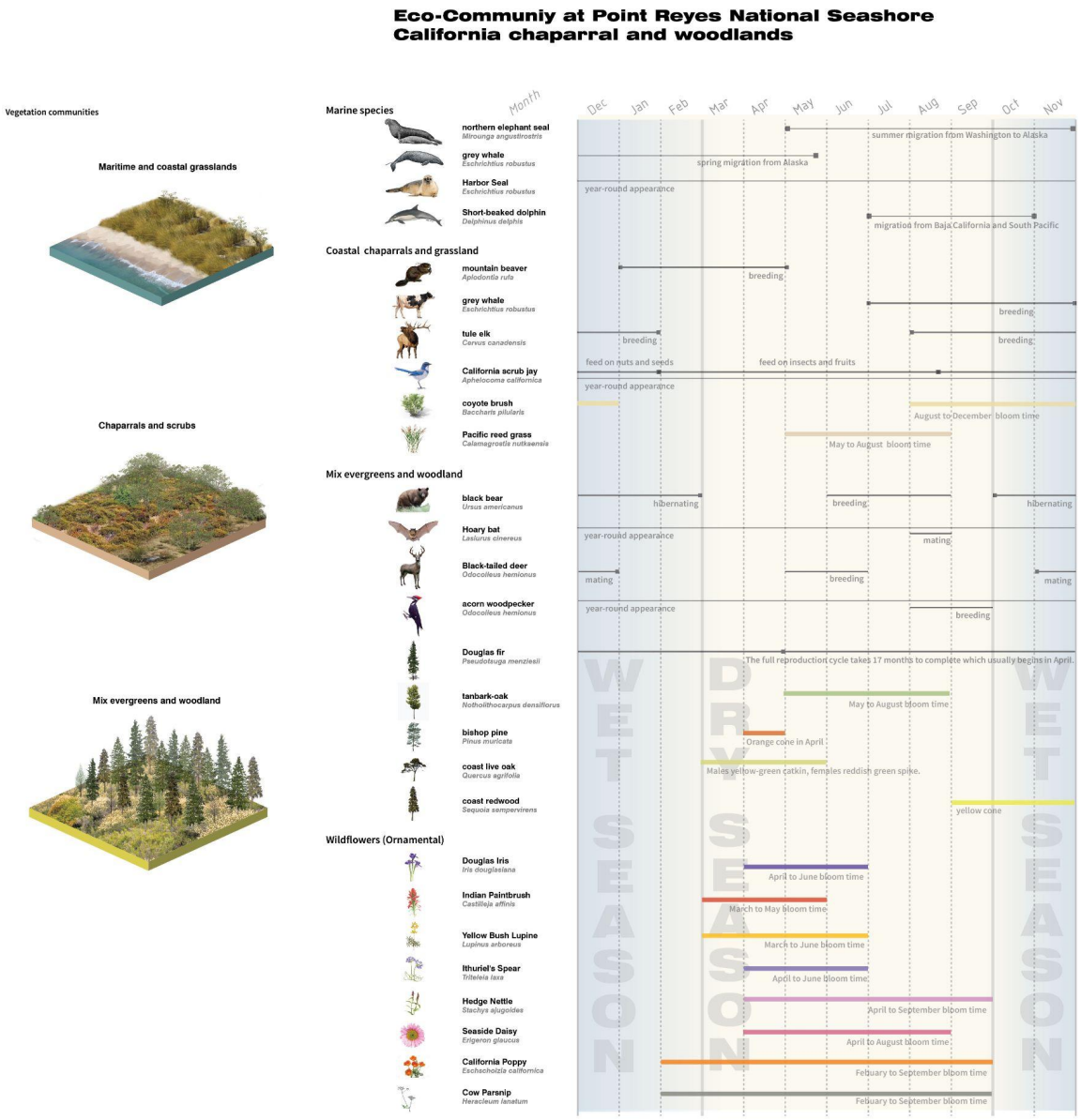

Figure 8. Major eco-communities and species of Point Reyes National Seashore, drawing by author

Figure 9. Coastal grassland near Drakes Estero, Point Reyes National Seashore, 2022, photo by author

Figure 10. Scrubs by the ranch, Point Reyes National Seashore, 2022, photo by author

Figure 11. Bishop pine forest and mixed woodland, Point Reyes National Seashore, 2022, photo by author

4.2. History and Problems

Humans have been active at Point Reyes National Seashore for more than 5,000 years. According to the National Park Service, Native Americans were living on the Point Reyes National Peninsula by then, including the Coast Miwok people (Figure 12). Remnants of their village sites can still be found in the National Seashore, comprising an important part of the cultural landscape heritage of the ancient residents.[6] Sir Francis Drake was the first European explorer known to have encountered the Point Reyes Peninsula, and later it became part of the colonies of the Spanish Empire.[7] Agriculture has been one type of land use in Point Reyes for thousands of years. Mexicans established ranchos in the peninsula, and European Americans established their own pastoral ranches there.[8] Since the mid-1800s, dairy ranching has become the major form of agricultural operations in Point Reyes and Marin county.[9] The Shafter/Howard dairy enterprise (1857-1939) marked the origin of the existing ranches, and descendents of those ranchers are still raising cattle with permission within the Point Reyes National Seashore today.[10]

[6] “History & Culture.” National Parks Service. U.S. Department of the Interior. Accessed March 11, 2022. https://www.nps.gov/pore/learn/historyculture/index.htm.
[7] “People.” National Parks Service. U.S. Department of the Interior. Accessed March 11, 2022. https://www.nps.gov/pore/learn/historyculture/people.htm.
[8] “People.” National Parks Service. U.S. Department of the Interior. Accessed March 11, 2022. https://www.nps.gov/pore/learn/historyculture/people.htm.
[9] Rilla, Ellie. “The Changing Role of Agriculture in Point Reyes National Seashore - UCANR.” *The Changing Role of Agriculture in Point Reyes National Seashore*, December 2009. https://ucanr.edu/sites/uccemarin/files/31000.pdf.
[10] “Historic Landscapes of Point Reyes.” National Parks Service. U.S. Department of the Interior. Accessed March 13, 2022. https://www.nps.gov/pore/learn/historyculture/places_historiclandscapes.htm.

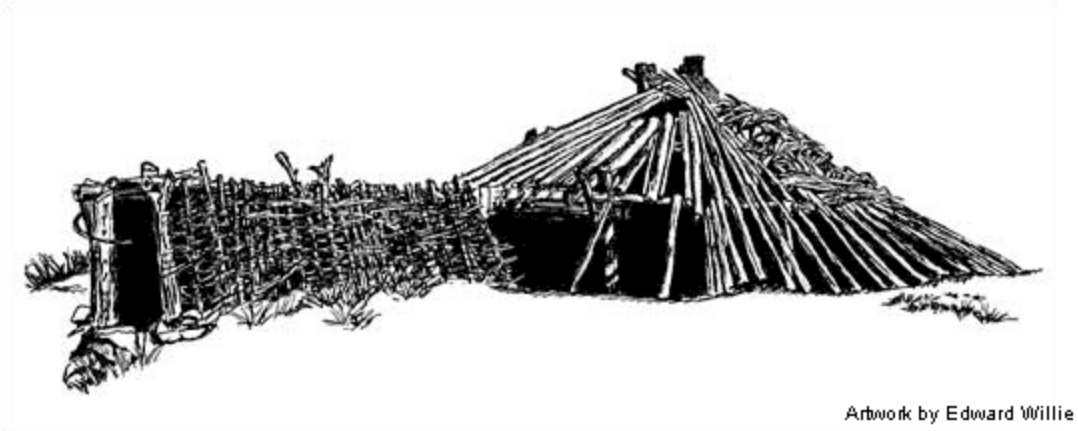

Figure 12. Miwok Sweat lodge, picture from Edward Willie[11]

Figure 13. Bondietti Ranch, now Hagmaier Ranch, photo by USGS Library[12]

[11] "Coast Miwok at Point Reyes." National Parks Service. U.S. Department of the Interior. Accessed March 13, 2022. https://www.nps.gov/pore/learn/historyculture/people_coastmiwok.htm.
[12] "History." Point Reyes Field Station. Accessed October 20, 2021. https://pointreyes.berkeley.edu/history/.

In 1935, Conard Wirth suggested that a national seashore be established on the Point Reyes Peninsula, and the Point Reyes National Seashore was established in 1962.[13] However, the dairy ranches persisted after management of Point Reyes was taken up by the National Park Service, and their presence has caused various problems during the past six decades. The National Park Service tried to compromise on the management authority of the pastoral land, as they failed to evict the ranchers. As Kenneth Brower said[14], "When the NPS carried out purchases of ranch land, it usually granted reservations of use and occupancy for a period of 25 years to those who wished to continue ranching (Deur and Mark 2011). "[15] Although ranchers' lands remained, they were under restrictions and had less power to control and manage their lands. However, NPS acknowledged these ranches and even invested in their rehabilitation in 1980.[16]

[13] Brower, Kenneth. "Reflections On 58 Years of Point Reyes National Seashore." Earth Island Journal , October 5, 2020. https://www.earthisland.org/journal/index.php/articles/entry/fed-plan-extend-point-reyes-ranch-leases-kill-tule-elk.
[14] Brower, Kenneth. "Reflections On 58 Years of Point Reyes National Seashore." Earth Island Journal , October 5, 2020. https://www.earthisland.org/journal/index.php/articles/entry/fed-plan-extend-point-reyes-ranch-leases-kill-tule-elk.
[15] "Point Reyes National Seashore: A Brief History of a Working Landscape." Accessed February 9, 2022. https://news.aag.org/2016/02/point-reyes-national-seashore-a-brief-history-of-a-working-landscape/.
[16] "Ranching History at Point Reyes." National Parks Service. U.S. Department of the Interior. Accessed March 13, 2022. https://www.nps.gov/pore/learn/historyculture/stories_ranching.htm.

Figure 14. Point Reyes National Seashore, picture from Pinterest[17]

Douglas Nelson, ASLA (American Society of Landscape Architecture) has pointed out that "the NPS does not have the staffing or resources to maintain these landscapes without grazing, and the elk alone are not capable of holding off the spread of scrub vegetation."[18] In addition, ASLA has supported what the NPS did as ASLA weighs more on the cultural landscape here and does not want to lose this which has been lasting for thousands of years. According to ASLA, the National Park Service has been charged throughout its history with managing the nation's treasured public lands, often by

[17] "PRNS Archives: Point Reyes National Seashore, Historical Photos, Point Reyes." Pinterest, October 17, 2012. https://www.pinterest.com/pin/308285536961956004/.
[18] Douglas Nelson, ASLA. "Battle for the Soul of Point Reyes National Seashore." The Field, August 22, 2019. https://thefield.asla.org/2019/08/22/battle-for-the-soul-of-point-reyes-national-seashore/.

balancing sometimes opposing goals.[19] It must preserve and steward these resources while also making them accessible to people, balancing access and resource protection. At Point Reyes, the National Park Service is attempting to balance long-standing cultural uses and significant cultural landscapes with the natural resources within the park.[20]

A lot of people disagree with what the National Park Service has done in keeping the ranches and benefiting the ranchers. As long as local ranchers are stakeholders within the National Seashore, their ranching activities will make the survival of the native species more difficult.[21] For instance, tule elk (*Cervus elaphus nannodes*), a local native subspecies of elk, was reintroduced into Point Reyes National Seashore in 1978.[22] They used to range widely in central California, but now they are protected at state and federal levels.[23] As the ranches overlap with the elk distribution area, tule elks are facing habitat loss and competition with ranch animals.

The new General Management Plan Amendment by the National Park Service addresses the management of ranches and has led to the "controversy that split environmentalists, with varying factions supporting and opposing the continued ranching activities within the park… Complicating the issue is the status of tule elk in the park and conflicts between the elk and the ranching activities."[24]

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[19] Douglas Nelson, ASLA. "Battle for the Soul of Point Reyes National Seashore." The Field, August 22, 2019. https://thefield.asla.org/2019/08/22/battle-for-the-soul-of-point-reyes-national-seashore/.

[20] Watt, Laura A. "The Trouble with Preservation, or, Getting Back to the Wrong Term for Wilderness Protection: A Case Study at Point Reyes National Seashore." *Yearbook of the Association of Pacific Coast Geographers* 64, no. 1 (2002): 55–72. https://doi.org/10.1353/pcg.2002.0009.

[21] "Surrendering Nature to Politics: Are Us National Parks in Retreat?the Triumph of Cattle and Farmers over Elk in Point Reyes Echoes the Same Public Outrage Involving Wapiti, Wolves and Bison in Yellowstone, Grand Teton and Grand Canyonby Hank Perry, Ken Bouley, Daniel Dietrich and Kenneth Brower." Mountain Journal. Accessed December 21, 2020. https://mountainjournal.org/clash--between-cattle-and-elk-at-point-reyes-brings-national-park-values-into-focus.

[22] "Tule Elk." National Parks Service. U.S. Department of the Interior. Accessed March 22, 2022. https://www.nps.gov/pore/learn/nature/tule_elk.htm.

[23] Ramos, Christopher. "American Elk." ArcGIS StoryMaps. Esri, October 16, 2019. https://storymaps.arcgis.com/stories/c249e8b2f6f1402594dd0a096452b8e8.

[24] staff, ASLA. "Battle for the Soul of Point Reyes National Seashore." *The Field*, August 22, 2019. https://thefield.asla.org/2019/08/22/battle-for-the-soul-of-point-reyes-national-seashore/.

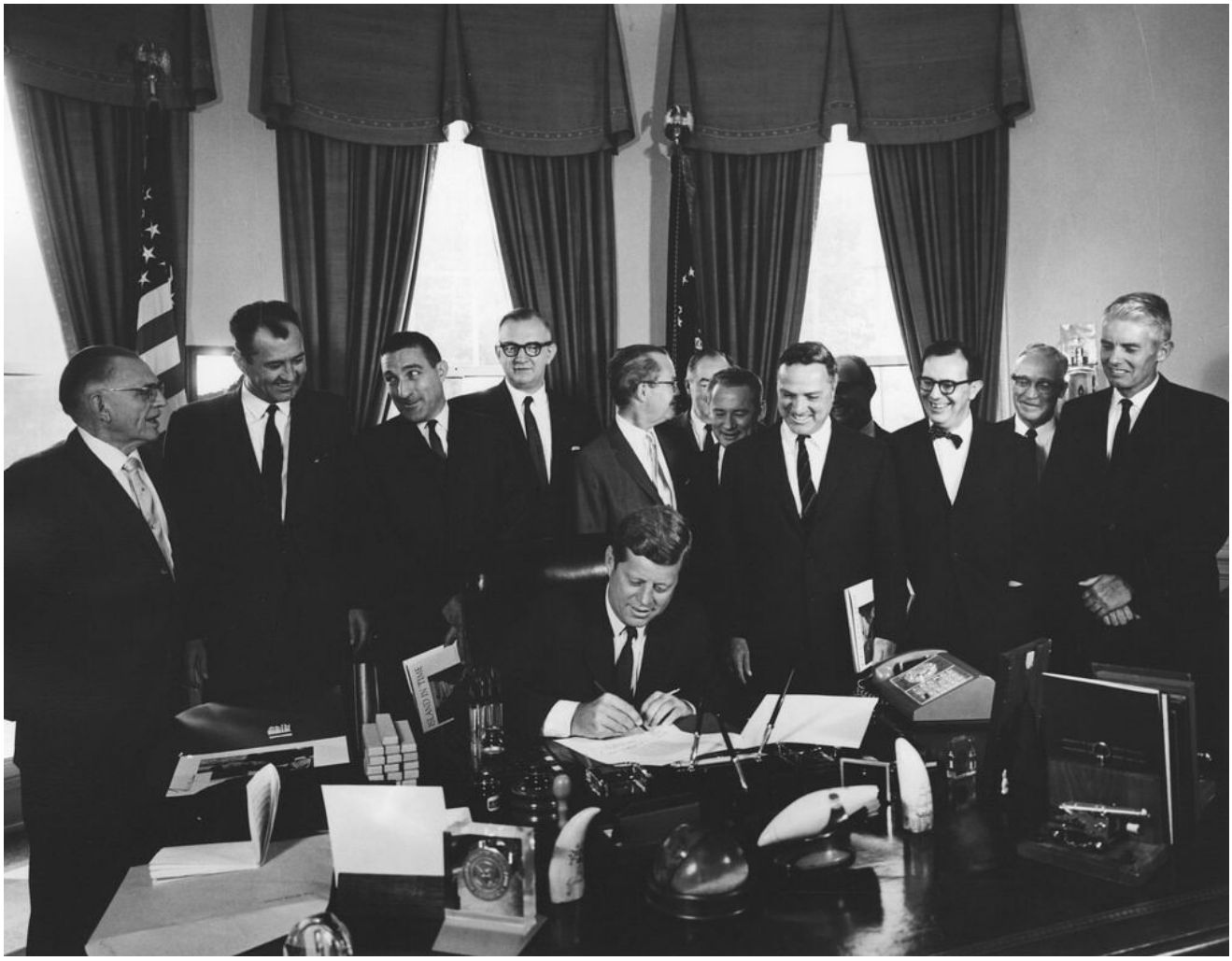

Figure 15. September 13, 1962. JFK signs the enabling legislation for Point Reyes National Seashore, photo by White House photographer Abbie Rowe[25]

[25] Brower, Kenneth. “Reflections On 58 Years of Point Reyes National Seashore.” *Earth Island Journal* , October 5, 2020. https://www.earthisland.org/journal/index.php/articles/entry/fed-plan-extend-point-reyes-ranch-leases-kill-tule-elk.

4.3. Issues and Opportunities

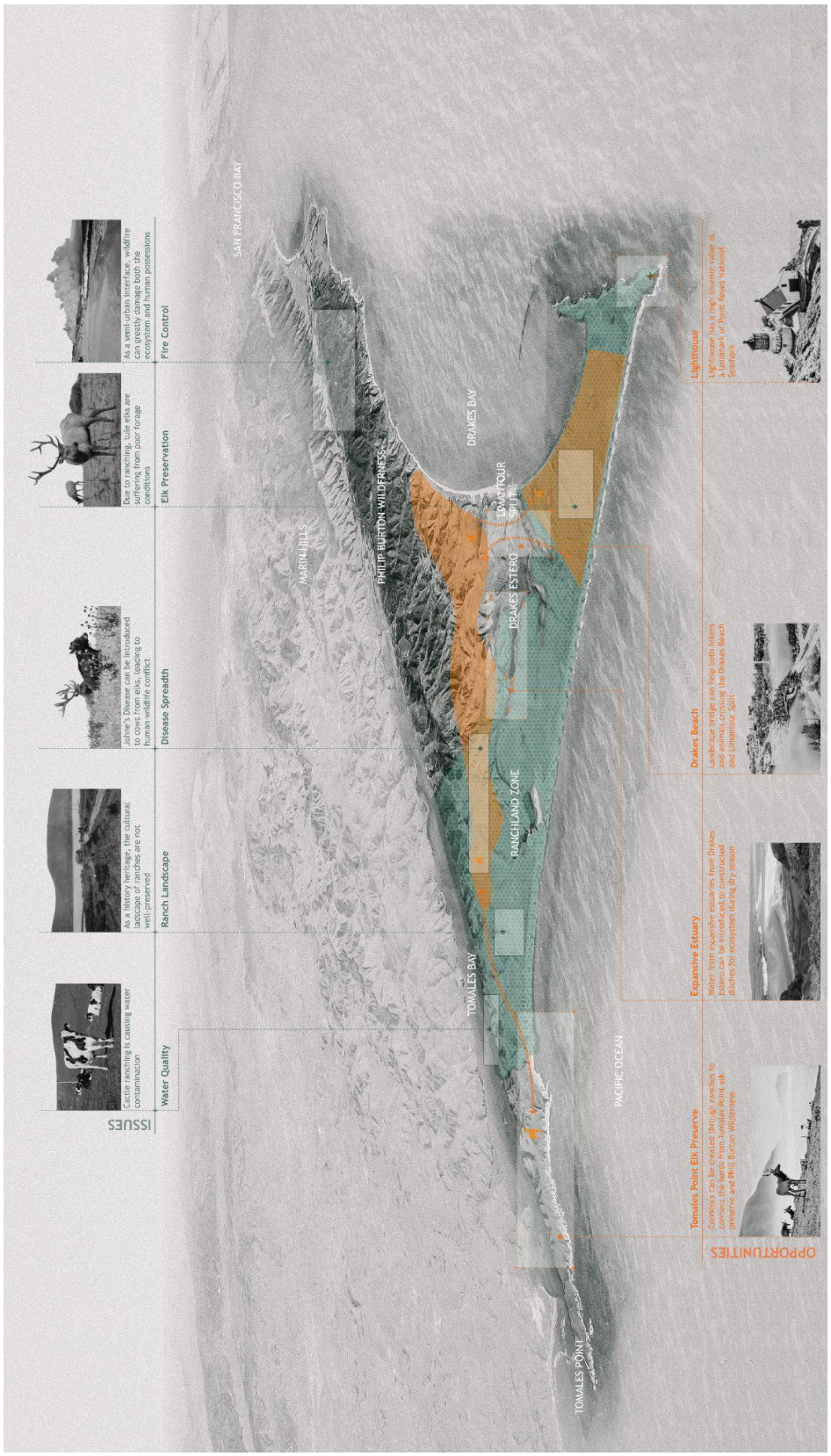

Figure 16. Issues and Opportunities, drawing by author

In keeping with the site information discussed above, several major issues should be addressed when designing possible futures for Point Reyes National Seashore. First is the competing interests between cattle ranching and elk protection. The ranches reduce the size of elk habitat available, and ranch cattle compete with elks for food source. The large population of cattle also produces an abundant amount of waste, which can cause contamination in local water systems upon which other animals also rely for drinking water.[26] Additionally, Johne's disease, a type of intestinal infection that is typically fatal, can spread among ranch cattle and tule elks if they eat vegetation contaminated by infected waste.[27] In general, the preservation of tule elk is poor. Another issue is the low quality of preservation of the local historic ranches. As recognized examples of cultural heritage landscape, their management should not be left to the ranchers alone. Instead, they should be preserved and developed in part by the public, and they should be accessible to the public, even as they make profits for local ranchers.

In addition to the issues named above, the site presents numerous opportunities (Figure 16). For example, the expansive estuary can accumulate a large abundance of water and store it in the surrounding marshland, where many aquatic species thrive. The marshland can provide ample water source for tule elk facing the dry season, and it is also close to the coastal grassland where the elk lives. However, the edge between the grassland and the marshland is steep and rough, making it difficult for the elk to access. Thus, new ditches extending marshand to the elk's grassland habitat would be beneficial for tule elks, as it would facilitate access to water. Another opportunity is in connecting the dispersed metapopulation of tule elks. Specifically, an ecological corridor could be established between the Tomales Point Elk Reserve at the northwest point of Point Reyes Peninsula and the Limantour herd at the south part of the peninsula. If that connection were made, the distribution of the two herds would be

[26] "04 - Food and Agriculture Organization." Livestock's role in water depletion and pollution. Accessed April 8, 2022. https://www.fao.org/3/a0701e/a0701e04.pdf.

[27] "Johne's Disease Faqs." National Parks Service. U.S. Department of the Interior. Accessed January 16, 2021. https://www.nps.gov/pore/getinvolved/planning_tule_elk_johnes_disease_faq.htm#:~:text=Johne's%20disease%20has%20been%20detected,potential%20carriers%20of%20the%20disease.

merged and thereby better established, enhancing the stabilized conditions of tule elk metapopulation on the peninsula. Similar strategies could be applied to connect the Limantour herd and elk colonies living in the ranching areas on the west part of the peninsula. Constructions such as ecological bridges can facilitate the migration of tule elks.

Figure 17. Private Authorized Area, Point Reyes National Seashore, 2022, photo by author

Figure 18. Cattle Grazing on Wildlands, Point Reyes National Seashore, 2022, photo by author

5. Design proposal

5.1. Attitudes towards Design

My own attitude towards management and how design interventions could benefit the Point Reyes National Seashore is greatly influenced by the theory of "biculturalism." Different from ideas of discrete anthropocentrism and over-environmentalism, biculturalism seeks a eliminate and transcend the dichotomous human-nature relationship, which motivates stakeholders to consider themselves as part of ecosystems, and helps humans to survive and interact with other creatures in nature sustainably.[28] In my opinion, it is important for design interventions at Point Reyes to be elk-oriented. Yet, while it is always difficult to benefit the interests for both tule elks and humans, it is not feasible to neglect the economic demands of ranchers and local agricultural activities when focusing on ecological design.

Said differently, the application of design through interventions at Point Reyes National Seashore should fulfill the requirements of sustainable development.[29] Sustainable design provides suitable and beneficial implementation for fulfilling the requirements of ecological, economic, and social development. While I focus on improving habitat for tule elks and other wildlife, as well as presenting the ecosystem to national park visitors at a disturbance as low as possible, design proposals should also consider the interests of local human stakeholders (mainly ranchers). The design concepts here include "design for wild," "design as wild," and "design with wild."

[28] Robertson, D. P., and R. B. Hull. "Which Nature? A Case Study of Whitetop Mountain." *Landscape Journal* 20, no. 2 (2001): 176–85. https://doi.org/10.3368/lj.20.2.176.

[29] "What Is Sustainable Development, and Why Is It so Important?" *Emerald Built Environments*. Accessed November 17, 2020. http://emeraldbe.com/sustainable-development-important/.

Figure 19. Private possessions on Historical Ranch D, Point Reyes National Seashore, 2022, photo by author

5.1.1. Design for wild

"Design for wild" means the objective of design implementation is to establish and/or enhance the function of tule elk preservation by guaranteeing the quality of their habitat.

5.1.2. Design as wild

"Design as wild" means the design is animal-oriented, which requires consideration of the ethology of the target animal. For example, a corridor for tule elks should connect their preferred habitats and be based on their preferred types of movement.

5.1.3. Design with wild

"Design with wild" emphasizes on the co-existence of humans and wildlife. Proposals and interventions in this category should mitigate conflicts between ranching activities and tule elks with the objective of establishing harmony between those. As a national

park, the redesigned site should also support the experiences of visitors as an ecosystem service.

Figure 20. Tule Elks within the Ranch, Point Reyes National Seashore, 2022, photo by author

5.2. Design Objectives

Building on the discussions above, my design proposal offers methods for 1) restoring the habitat of the tule elk, 2) using design interventions to deal with land use- and encounter-based conflicts, and 3) creating landscapes for better human recreational experiences.

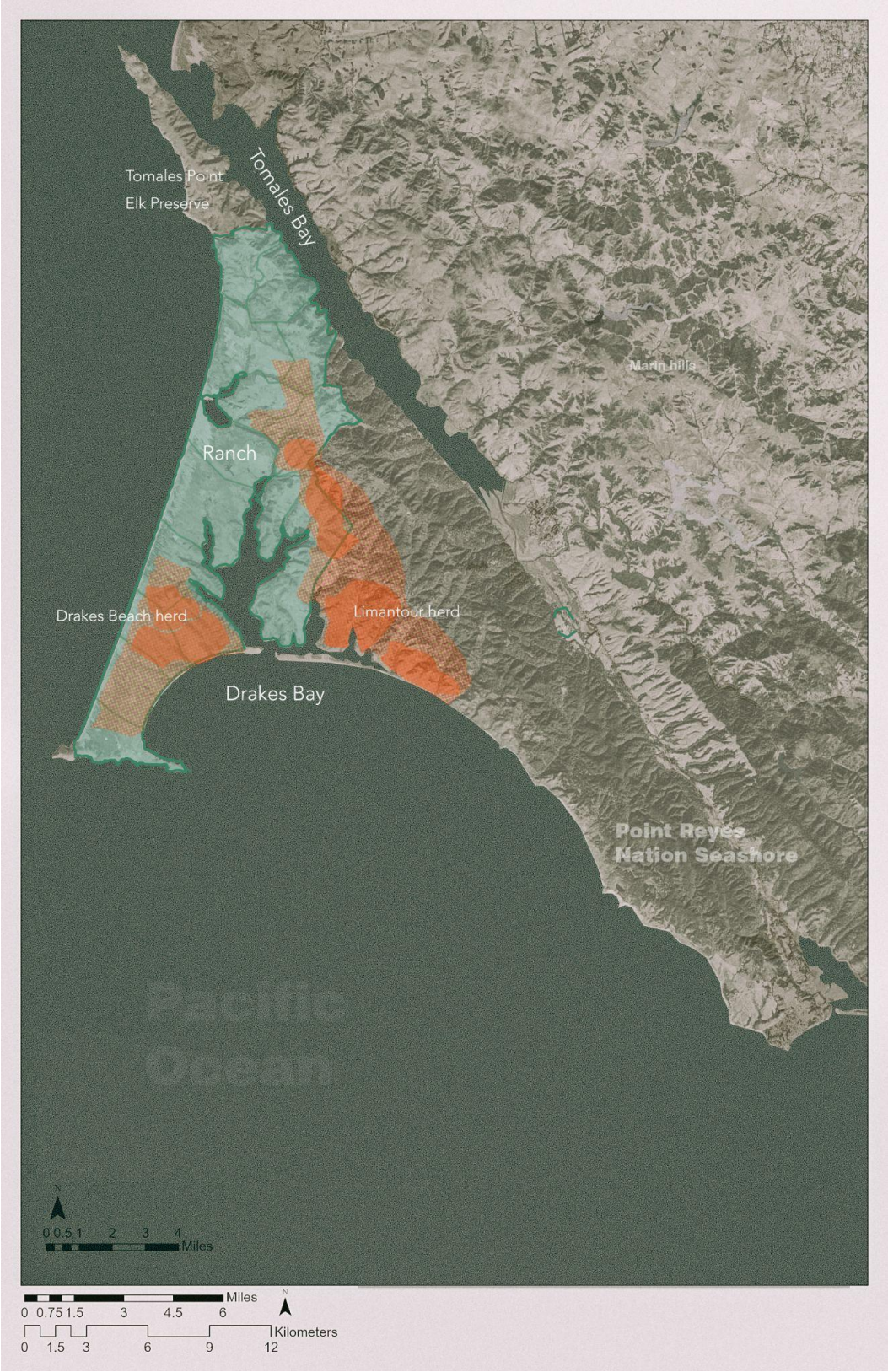

Figure 21. Ranch and Tule Elk Distribution at Point Reyes National Seashore, map by author

5.3. Prototype Scenarios

As depicted in Figure 22, the major strategies for design intervention include a Tomales Point Elk Reserve - Limantour herd corridor, which could connect the dispersed herds of elk preservation area through the ranch land on the Point Reyes Peninsula. There are also proposed topo ditches located at the edge of the estuary in dispersal for water source during the dry season. The detailed design methods are illustrated in the following 25 prototype scenarios shown in a chart of axonometrics, and the included strategies can be applied at various conditions within the site. These scenarios can be divided into five major categories, including: non-ranch wildland, ranch, paved roads, water crossing and water front (Figure 23).

5.3.1. Non-ranch wildlands

The non-ranch wildlands are wilderness areas that are not for pastoral utility. Within these scenarios, proposed design strategies include the following:

- introduction of unpaved pedestrian trails, which appear natural in most area of wildland;
- boardwalks, which are applied where the ground is wet or covered by dense vegetation, and high-elevation boardwalks where the ground is too steep or rough;
- rest areas elevated high above the ground plane; these include joined, hexagonal, wooden platforms among sections of elevated boardwalks, provide seating for users, and allow trees to grow through; and
- unranched corridor inserts, as naturalized corridors connecting non-ranching areas within ranching areas;

5.3.2. Ranches

The strategies applied to ranches focus on the coexistence of humans and diverse non-human animals but introduce landforms to prevent interactions between ranch animals and tule elks. Examples here include

- steep slope separations, with additional barriers formed by dense vegetation, dividing ranching and non-ranch areas; they can be used to separate species;
- ha-ha separations, trench-form barriers that proliferated in 18th-century British estate landscapes; they prevented animals from entering areas where humans circulated and resided, yet they promoted human visual experiences of picturesque landscape;
- boardwalk separations, which can function as a type of fence between different species of animals while providing paths for visitors;
- vegetation separation, using dense, thorny vegetation to prevent animals from crossing between ranches and wildlands; and
- common fences to enclose a ranch.

5.3.3. Paved road crossings

This strategy focuses on design interventions that help animals and visitors cross vehicular roads. The types of intervention include the following:

- boardwalk connections, in which boardwalk connect berms as a bridge for animal migration;
- “Hyper Nature” green corridor; similar to the project “Hyper Nature” by MVVA, this is a bridge covered with soil and plants and by which animals can cross a road, with vehicles going beneath.
- Tunnels for vehicles in areas with rough/hilly topography;
- sunken roads with rock retaining walls on both sides and plant-covered “earth bridges”on top;
- tunnels for animals, specially built for animal crossings while the paved road is constructed on the ridge of the hill.

5.3.4. Water crossings

Water crossings focus on strategies to help animals and visitors cross water surfaces. Proposed design interventions include

- suspension bridge built on the cliffs on both sides of the river;
- lifted boardwalks, which includes application of elevated boardwalk for people to cross to cross the shallow stream with low speed of flow; Sunken corridor, a sunken corridor that goes into the water with glass boards retaining on the both sides, allowing people to go down under water level and observe the underwater world; “Earth bridge”, a plant-covered bridge built for animals to cross the river; and Resilient berms, which consists of double-berm of levees at the waterfront to prevent flood, with pipes on the berms to allow high level water trespassing and filling the gap between berms.

5.3.5. Waterfront

These design interventions focus on strategies for waterfront with multiple functions:

- high-lifted levees that can separate water and ranches while allowing traffic on the top of the berm;
- naturalized riverbanks with uncrafted waterfront and various species;
- wetland boardwalks, which can be set over constantly flooded areas or swamps and wetlands for tourists to discover the ecosystems inside; and
- overlooks made of multiple kinds of materials (concrete, wood, etc), which can be built on the cliff by the seashore.

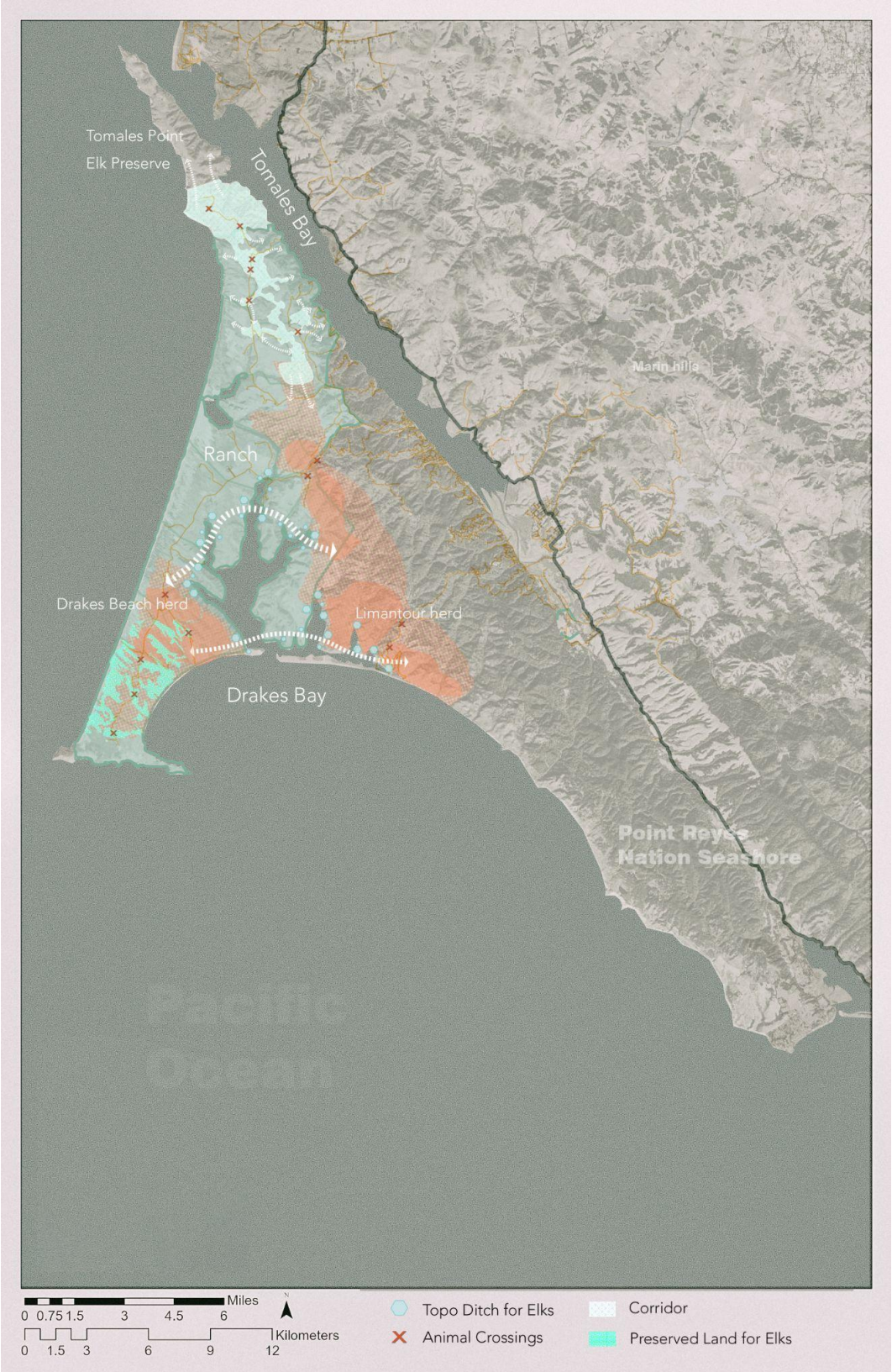

Figure 22. Major Strategies of Design Intervention at Point Reyes National Seashore, map by author

Figure 23. Scenarios of Design Interventions, drawings by author

5.3.6. Scenario distribution

The strategy scenario discussed above can be applied and distributed in certain smaller sites within Point Reyes National Seashore. After assessing significant factors such as topography and land-water spatial correlation analysis, I selected ten specific sites to which my design interventions can be applied practically and variously (Figure 24). These sites are : (1) Drakes Estero at Limantour Beach, (2) Drakes Marshland, (3) Tomales Bay, (4) West Beach, (5) Point Reyes Lighthouse, (6) Peninsula of ranches, (7) Limantour herds, (8) Inverness Hills, (9) South Beach, (10) California's Pacific Coast Highway (State Route 1), and (11) Point Reyes Station. As shown in Figure 24, each site has been assigned with various scenarios for design intervention. For instance, (1) Drakes Estero at Limantour Beach is an estuary and lagoon area, and the unique aquatic ecosystem here provides possibilities for resilient berms, suspension bridge and waterfront designs. (4) West Beach is a section of seashore along the ocean, it is the ideal place to insert overlooks by the sea, levees for tides and unpaved trails for hikers. (7)Limantour herds is a mountainous area accommodating tule elks, and there are also dense woods and lush ground vegetations. For this place, elevated boardwalks are necessary facilities for visitors to access into the habitats.

5.4. Site Plans

Among the ten sites chosen, three were selected for design elaboration given their representative landforms/topography, land use, and bio-communities. Those factors allowed me to explore site-specific scenarios to which distinct strategies can then be applied. I chose Peninsula of ranches, Tomales Bay, and Drake Estero. These areas are in dispersed locations on Point Reyes that include tule elk habitats. My major objectives in addressing the sites were to establish corridors connecting the metapopulation of tule elks throughout the Peninsula and to restore the interests of local stakeholders as much as possible. Meanwhile, I propose facilities such as an overlook tower and a new trails system to improve visitor experience, and I advocate for local stakeholders to shift the basis of their revenue. After renewal of the lands through design, stakeholders will be able to envision new land uses where eco-friendly tourism can be introduced, which benefits not only their private interests but also the local ecosystems and visitors.

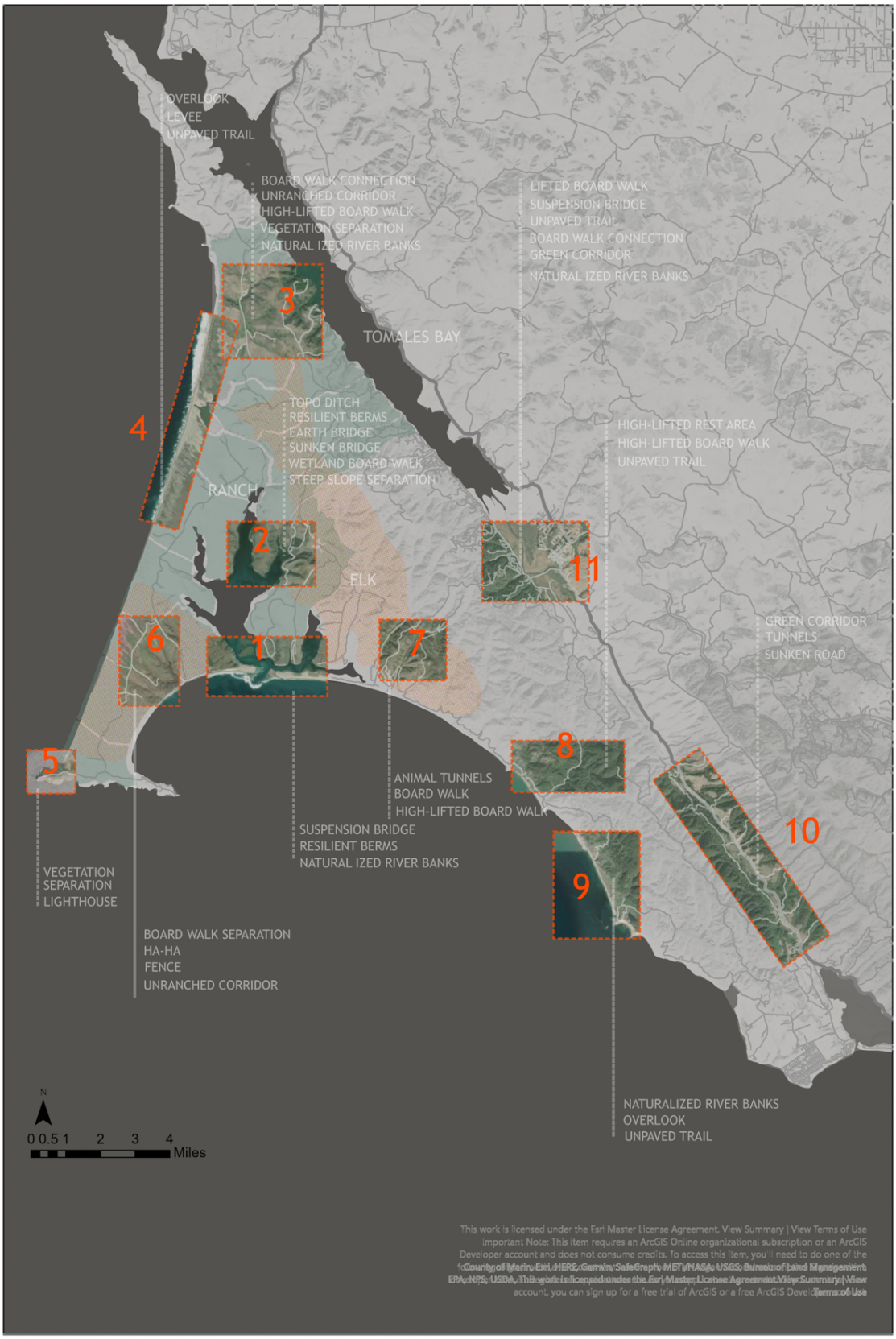

Figure 24. Senario Distribution of Design Intervention, map by author

Figure 25. Peninsula of Ranches, Point Reyes National Seashore, 2022, photo by author

Figure 26. Bay by Tomales Point, Point Reyes National Seashore, 2022, photo by author

Figure 27. Marshland at Drakes Estero, Point Reyes National Seashore, 2022, photo by author

5.4.1. Peninsula of ranches

The Peninsula of ranches is located on the southwest outreach peninsula of Point Reyes Point Seashore. The area is unique relative to other parts of Point Reyes as most of the grand historical ranches are located within it. Together, the pastoral ranches cover a massive area of land that overlaps with tule elk habitats, so the land use issue becomes a priority for design interventions in this area. As for existing conditions, there are not only pasture zones but also Resource protected areas within the range of these historical ranches and there are groups of tule elks enclosed in fences like new ranch animals. The scattered colonies cannot do anything beneficial to the metapopulation on Point Reyes Peninsula, so I propose a much larger Elk Reserve to connect the dispersed habitats. To address the issue of land use, the major tension which needs to be mitigated is to find a proper way for elk and cattle to co-exist so that the ranchers here can accept the elk-oriented management towards their lands. To guarantee the

interests of these stakeholders means to guarantee the living conditions of ranch animals, especially cattle. In terms of strategies, some scenarios from the category "Ranch" can be applied to separate different species of animals and in particular to avoid interactions between cattle and elk that have potential to spread disease. Simultaneously, the proposed interventions aim to preserve the aesthetic value of existing landforms. Based on holistic consideration of topography, location relative to water, and food sources, I planned this Elk Reserve with design interventions including vegetation separation, trench separation, boardwalk separation, and unranched corridors as migration routes for habitat connection. I also proposed animal crossings for elks to cross vehicular roads (Figure 28).

Figure 28. Site Plan 1: Peninsula of Ranches, map by author

5.4.2. Tomales Bay

Tomales Bay is located between the narrow northwest part of Point Reyes National Seashore and mainland California. The target site range covers the land part of Point Reyes within this area. This area connects the north part, Tomales Elk Reserve, and the south part, the rest of Point Reyes Peninsula. There are tule elk colonies living within the Tomales Elk Preserve in the north part of the Peninsula around Tomales Point, and they are a dispersed population separated from the rest of the tule elk colonies on Point Reyes Peninsula. Thus, the key point of design within this area is to propose a habitat corridor for elks within the ranch area through which they can migrate and connect with the population in the Tomales Elk Reserve to the north and the Limantour herd in the south. The method I use for discerning a potential route for elk migration is similar to that applied in my proposal for the Peninsula of ranches, plus, I also manage to set the corridor to avoid overlaps with the ranches as much as possible. In terms of visitor experience, there are few existing trails within the site, so I propose to add more so that visitors can hike through the coastal grassland and access the bay. The strategies I use here include various boardwalks and animal crossings (Figure 29).

Figure 29. Site Plan 2: Tomales Bay, map by author

5.4.3. Drakes Estero

Drake Estero is a massive estuary where salt water of the Pacific Ocean meets fresh water from the land. Large areas of coastal marshland allow many species to thrive here. Multiple landform types, like beach, lagoon, marshland, and coastal grassland, as well as interesting species of animals, including various aquatic birds and salmon, make this area of high interest to visitors. At the same time, a major tule elk population, the Limantour herd, ranges on the east side of the Drake. Therefore, Drake Estero is an ideal place for visitors to observe the ecosystem, the habitats. and the species within those. For the intervention strategies here, I focused more on waterfront design. I proposed different styles of bridges and other water crossings to enrich visitor experience and to benefit elk connectivity. I inserted more trail routes with boardwalks so that visitors can access interior marshland for better observation of aquatic wildlife.

The proposed topo ditch can provide water sources for tule elks and other animals as well as guaranteeing vegetation growth during the dry season.

There is also a steep cliff near Limantour Split. The insertion of an overlook platform with ocean views can establish a new place of interest within the site.

Figure 30. Site Plan 3: Drakes Estero, map by author

Figure 31. Proposal of Drakes Estero Grassland, drawing by author

Figure 32. Proposal of High-lifted Rest Area, drawing by author

Figure 33. Proposal of Overlook Platform, drawing by author

6. Discussion

My expectation of positive outcomes if the design proposals presented above are implemented is grounded in how the prototype scenarios relate to the larger objectives. Design strategies can restore and improve habitats for tule elks, facilitating their survival and leading to a stable elk population. The proposed design interventions also prevent ranch animals from being negatively affected by wildlife, which helps ensure ranchers' profits and makes ranching activities more sustainable. Even more, the design helps local cultural and natural landscapes develop and become more visible, which may improve their value for tourism by enriching visitors' experiences.

The strategies are proposed based on my own knowledge of Point Reyes National Shore. The design interventions are conceptually reliable as they accord with local climate, history, and ecosystems and consider stakeholders' interests. They can successfully address the rancher-elk conflict by accommodating tule elks as well as preventing damage by wildlife to ranchers' interests.

The design proposal aims to achieve the three primary objectives of sustainable development: economic growth, environmental protection, and social inclusion.[30] In terms of environment, it restores local ecosystems and supports habitats; in terms of economy, it guarantees stakeholders' profits, benefiting agriculture as well as stimulating tourism locally. In terms of society, it preserves the heritage value of cultural and natural landscapes and attracts more attention and visitors, which enhances social engagement with the site.

There are also limitations to the design proposal. One major limitation is that separation is not an ideal way to mitigate mutual negative impacts between ranch animals and tule elks, such as the spread of Johne's disease. Landscaping methods should ideally utilize the land more efficiently and facilitate spatial co-existence, instead of splitting territories and erecting barriers between them. Finding a better approach will require more design research. Additionally, the outcomes of the proposed design are difficult to quantify. While ecological and economic indexes could have been

[30] "What Is Sustainable Development, and Why Is It so Important?" *Emerald Built Environments*. Accessed November 17, 2020. http://emeraldbe.com/sustainable-development-important/.

analyzed in the first steps of research on Point Reyes National Seashore, the design proposal is a prototype and would require further, tangible development in order for its effectiveness to be evaluated in future studies.

7. Conclusion

In developing this MLA thesis project, I conducted types of research which I had not experienced before: doing literature review to find an issue of high research value, seeking local data to expand my capability as a landscape architect, and generating design objectives and providing design proposals by myself. During this process, I have also thought a lot about the human-nature relationship and how that has evolved over time along with the evolution of humans. Humans were long in awe of nature, but as technology developed, they seemed to conquer nature. However, environmental problems are becoming more evident, and humans are turning their minds to creating methods for thriving in harmony with nature. That turn has provided me with inspiration for design and a sense that landscape architects should follow specific design principles: (1) landscape design should respect the equal rights of nature and provide holistic solutions; (2) when focused on a particular issue, the design should be target-oriented; (3) each design should be sustainable, and (4) both natural and cultural landscape should be well-preserved. As National Park Service historian Timothy Babalis (2011) wrote, "environmental history can provide information of great practical interest to resource managers as well as offering a valuable perspective on management practices," and it "also acknowledges the active capacity of the environment to influence and form human history, as well as being the place where that history unfolds."[31] Designers should learn from history, and design should be derived from the environment.

I believe that the design prototype and strategies presented in this thesis could be applied to the management of other national parks, especially in mitigating conflicts between humans and wildlife where they ideally co-exist.

[31] Babalis, Timothy. "Restoring the Past: Environmental History and Oysters at Point Reyes National Seashore." *The George Wright Forum* 28, no. 2 (2011): 199–215; 199. http://www.jstor.org/stable/43598190.

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