Defenders of Wildlife, Living Lands Program

Summary of Land Trust Workshops on "Building Your Own Vision of Climate Change Adaptation"

Climate change adaptation is defined as an adjustment in natural and human systems in response to expected climate change impacts that we will be unable to prevent (Intergovernmental Panel on Climate Change, 2007). In discussions about the role of land trusts in implementing climate change adaptation strategies, many have suggested that most of what land trusts already do is adaptation, while others have expressed the contrary position is that adaptation is not "business as usual" for land trusts. Others worry that adaptation planning will take a lot of time and resources away from the day-to-day work of saving land. And others feel there is not yet enough information to start planning for how they will adapt their work to this new reality. These differing ideas can be confusing and discouraging.

To help get past this confusion, Defender's Living Lands facilitated workshops at the most recent Southeastern Regional, Virginia, and Maryland land trust conferences to help the land trust community and their partners define their own vision for helping their communities adapt in the face of climate change.

The goal of this facilitated workshop was to demonstrate a quick and inexpensive process by which land trusts can begin to envision how climate change adaptation is part of their land conservation mission.

In this participatory workshop, Defender's staff facilitated a conceptual modeling exercise to build a common understanding of the biological environment and the social, economic, political, and institutional systems that affect their conservation priorities. This process, called a "situation analysis" is described in Step 1 of the Open Standards for the Practice of Conservation. The Open Standards were developed by the Conservation Measures Partnership (CMP) to bring together common concepts, approaches, and terminology in order to help practitioners improve the practice of conservation.

Planning for climate change adaptation will require that land trusts assess the drivers (e.g. air and water temp increases, precipitation changes, sea level rise, species shifts in ranges) and the indirect and direct threats (e.g. floods, human responses, drought, invasive species outbreaks) to their conservation values under climate change. A "situation analysis" is a useful tool for documenting the drivers and threats affecting a biodiversity target as well as for identifying conservation actions that can be applied to contributing factors, direct threats, or even biodiversity targets (Figure 1).

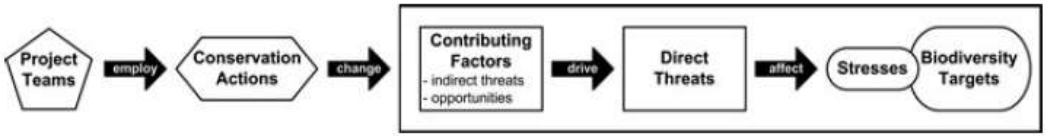


Figure 1. A general model of a conservation project. Conservation actions can be applied to contributing factors, direct threats, or even to biodiversity targets as indicated by the box around these factors. See text for definitions.

Source: Salafsky et al. 2008

Workshop participants developing a "situation analysis for climate change effects on coastal ecosystems.

Basic conceptual model components

Biodiversity targets: (green stickies) The biological entities (species, habitats, or ecosystems) that a project is trying to conserve. Some practitioners also include ecological and evolutionary phenomena and processes as targets. Synonymous with *focal conservation targets* and *biodiversity features*.

Direct threats: (pink stickies) The proximate human activities or processes that cause destruction, degradation and/or impairment of biodiversity targets. Synonymous with *sources of stress*. Natural phenomena are also regarded as direct threats in some situations (i.e., climate change).

Stresses: (blue stickies) The biophysical impact of a direct threat on a target, i.e., attributes of a conservation target's ecology that are impaired directly or indirectly by human activities.

Contributing factors: (orange stickies) The ultimate factors that enable or contribute to proximate direct threats. Synonymous with *underlying factors*, *drivers*, or *root causes*.

Conservation strategies: (yellow stickies) Interventions undertaken to reach the project's objectives and ultimate conservation goals. Actions can be applied to contributing factors, direct threats, or directly to the targets. Synonymous *with actions, interventions*, *activities*, *responses*.

Sources: Salafsky et al. 2008 and FOS, 2009

We began the exercise by identifying the biodiversity **targets** as the habitat types used in the State Wildlife Action Plans of the southeastern US. For each habitat type we identified direct threats (which we cross-walked with the Standardized Threats Taxonomy developed by the CMP).

Conducting the Situation Analysis

Using the US Global Change Research Program, Regional Climate Impacts: Southeast report (see box) and the Classification of Climate-Change-Induced Stresses on Biological Diversity, we identified the **contributing factors** related to climate change (i.e. climate change drivers) that lead to the direct threats and stresses on the target habitats. Contributing factors are often the entry points for conservation action (although actions may work through direct threats or even the target in some cases).

Summary of Climate Change Effects from the U.S. Global Change Research Program, Regional Climate Impacts: Southeast.

INCREASED AIR AND WATER TEMPERATURES

- Current: Since 1980, annual average temperature has risen about 2 degrees F. Greatest seasonal increase in temperature during the winter months.
- Projected: Continued warming in all seasons. Greatest temperature increases to occur in the summer months. The number of very hot days is to rise at a greater range than the average temperature. Freshwater temperatures will increase.

PRECIPITATION VARIABILITY, DROUGHT AND ALTERED HYDROLOGY

- Current: Average autumn precipitation has increased by 30 percent for the region since 1901. Has been an increase in heavy downpours. Moderate to severe drought has increased over past 3 decades, due to a combination of warmer temperatures and longer intervals between precipitation events.
- Projected: Variability in precipitation projections across models, but even under increased precipitation, higher evaporation due to increased temperatures is likely to lead to drier conditions. The frequency, duration, and intensity of droughts are likely to continue to increase.

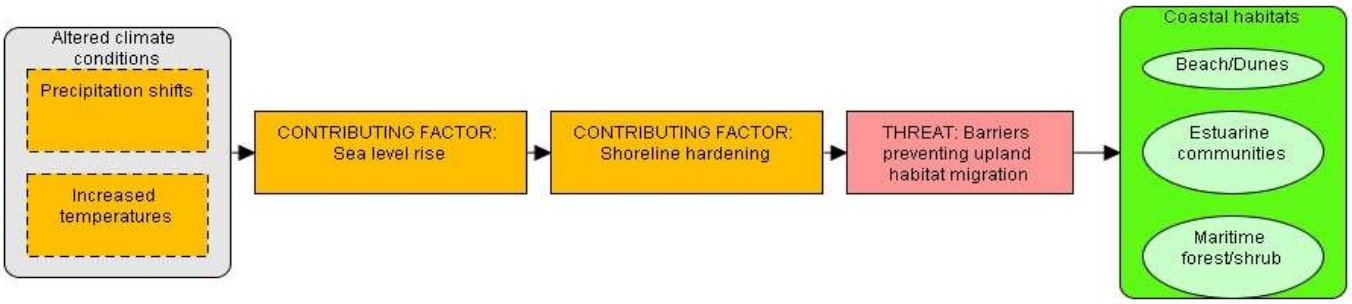
MORE INTENSE TROPICAL STORMS

- Current: The destructive potential of Atlantic hurricanes has increased since 1970.
- Projected: The intensity of Atlantic hurricanes is likely to increase during the century with higher peak wind speeds, rainfall intensity, and storm surge height and strength.

SEA LEVEL RISE

- Current: Florida (2mm/yr, which is about 8 inches per century)
- Projected: Varies along Atlantic coast, but for North Carolina 0.5 - 1.4 meters by end of century (1.5-4.5 ft), up to 0.3 m in Florida (1 foot). Coastal inundation and shoreline retreat will increase as sea-level rises accelerates (up to 2 feet or more).

Then we identified how changing climate conditions link to direct threats using intermediate contributing factors. The facilitators helped the participants think through the causal relationships linking the climate drivers to the direct threats. The following thought process was be helpful: ***Climate driver*** results in this ***contributing factor*** which results in this ***direct threat*** which affects [via a ***stress***] this ***target***.

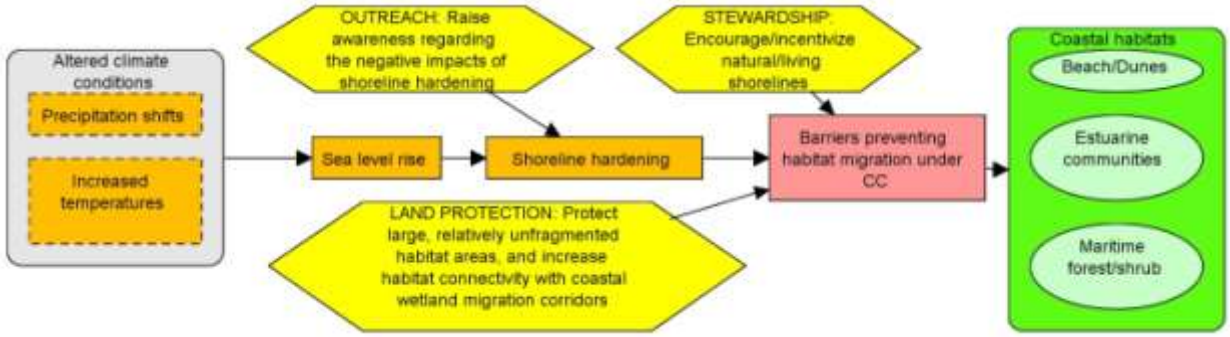


We were sure to discuss interactions between the climate drivers and non-climate threats (e.g. urban development). We captured these relationships and paid special attention to where they occur on the conceptual model. We identified potential relationships between climate factors and impacts on biological systems such as species range shifts, seasonal shifts, and disrupted biotic interactions.

As facilitators, we were aware that these steps would not be a linear process – participants found it useful to iteratively work backwards from the direct threats and forwards from the climate drivers. Several times, the groups came back to revise the elements, change their placement, and change connections as they built the conceptual map (see photo). We reminded participants that they would not be able to build a perfect model during the workshop but should aim to build a model that will help the group effectively communicate the major climate vulnerabilities that affect the system. Ultimately the process of building the conceptual model should assist the group in identifying intervention points, or adaptation strategies.

Developing Adaptation Strategies

The conceptual model shows the state of the world before taking action; the next step is for participants to think about adaptation strategies and the anticipated outcomes that will ultimately impact the habitat target. Participants identified broad categories of **climate change adaptation strategies** (e.g., outreach, policy, land protection, stewardship) and then described specific strategies that would reduce the effects of a contributing factor or direct threat on the habitat target.



We talked about which strategies participants felt were most likely to achieve the desired outcome and which they felt were the most relevant to their land conservation work. We found it useful to consider several factors when evaluating strategies including: the likelihood the strategy will be successful, the feasibility of the strategy, the cost of the strategy, and the gap the strategy would address. Participants also identified the sources of uncertainty associated with the strategies (e.g.,

uncertainty associated with one of the drivers such as the direction/magnitude of climate change, the biophysical impact, or the outcome of the management action). See below for sample conceptual maps for Southeastern forests and coastal habitats, including threats and intervention strategies.

Discussing Opportunities and Barriers to Implementation

As a wrap-up exercise, the group discussed what they felt were the opportunities and barriers to implementing some of the adaptation strategies they had identified. Many felt that the public's skepticism about climate change and lack of funding were the largest barriers. But they also felt that the issue of climate change was potentially an opportunity to reinforce support for their land conservation activities. Many participants in the workshop felt the exercise was helpful to their thinking about climate change adaptation and thought they would use this process to initiate discussions with their organizations and stakeholders about climate change adaptation.

References and Resources

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Summary of Workshop Results

Coastal habitats

Threats ranking

Urgency	Scope	Severity	Reversibility	Overall	Threats
					Non-climate related factors, such as lax local zoning, pressures for industrial development, and changing demographics, leads to increased coastal development and public access for recreation in coastal habitats.
					Changing climate conditions leading to sea level rise, which interacts with coastal development, which leads to the construction of barriers such as sea walls that prevent wetland habitat migration or beach nourishment in coastal habitats.
					Changing climate conditions lead to more intense hurricanes and storm surge, which interacts with sea level rise and with water withdrawals that lead to land subsidence to lead to land inundation and increased erosion of coastal habitats.
					Incompatible agricultural practices interacts with more intense precipitation events that leads to increased nutrient runoff into coastal habitats.
					Changing climate conditions lead to increase ambient temperatures that lead to increased water temperatures that promote algal blooms and dead-zones in coastal habitats.
					Changing climate conditions lead to seasonal shifts and species range shifts that lead to disrupted biotic interactions within natural communities in coastal habitats.
					Changing climate conditions leading to more favorable conditions for invasive species in coastal habitats.
					Other:

Strategies ranking

Robust under climate scenarios	Achieve desired outcomes	Social Feasibility	Cost Feasibility	Strategies
				Purchase land or easements to increase habitat connectivity with wetland migration corridors.
				Identify coastal climate refugia.
				Promote NRCS Wetland Reserve Program and other wetland protection programs to landowners to protect climate refugia.
				Protect buffer areas upslope of urban or agriculture development to improve water quality.
				Remove invasive species.
				Translocate species that won't be able to migrate to suitable habitat.
				Restore habitat buffers to protect from storm surge.
				Other:

Upland and Forest Habitats

Threats Ranking

Urgency	Scope	Severity	Reversibility	Overall	Threats
					Non-climate related factors, such as lax local zoning, pressures for industrial development, and changing demographics, lead to increased development and public access for recreation.
					More intense storms result in storm damage, forest wind-throw, and land-slides, which lead to dieback and destruction of forest habitat, and also make conditions more favorable to invasive species.
					Decreased soil moisture and water availability lead to increased risk of wildfire and forest dieback.
					CO2 in the atmosphere leads to acid deposition that leads to forest dieback.
					Seasonal shifts and species range shifts leads to disrupted biotic interactions within natural communities.
					Development leads to higher demand for energy that leads to energy development that leads to habitat fragmentation.
					Other:

Strategies

Robust under climate	Achieve desired outcomes	Social Feasibility	Cost Feasibility	Strategies
				Purchase land or easements to increase habitat connectivity and further limit the number of divisions allowed in easements.
				Encourage landowners to enter into contracts with the NRCS.
				Protect forest for carbon sequestration.
				Identify and protect climate refugia.
				Restore forest with more resilient species (e.g. drought tolerant).
				Remove invasive species.
				Use prescribed fire to reduce wildlife risk.
				Construct fire breaks and water catchment ponds.
				Translocate species that won't be able to migrate to suitable habitat.
				Reforest locally
				Other:

Freshwater Habitats

Threats Ranking

Urgency	Scope	Severity	Reversibility	Overall	
					Non-climate related factors, such as lax local zoning, pressures for industrial development, and changing demographics, lead to increased development and public access to freshwater habitats.
					Lax zoning regulations leads to urban development in riparian areas leading to removal of riparian forests combined with warmer ambient temperatures leading to warmer water temperatures that reduce coldwater habitat.
					Incompatible agricultural practices interact with more intense precipitation events that lead to increased frequency and intense flood events and nutrient runoff into freshwater habitat areas.
					Increase ambient temperatures lead to increased water temperatures that promote algal blooms.
					Intensification of agriculture and incompatible agriculture practices interact with seasonal shifts that lead to earlier snowmelt that leads to drier growing season that lead to decreased soil moisture and water availability for freshwater habitats.
					Changing climate conditions lead to seasonal shifts that lead to species range shifts that lead to disrupted biotic interactions within natural communities.
					Changing climate conditions lead to seasonal shifts that lead to more favorable conditions for invasive species.
					Human demand for energy leads to energy development (e.g. dams) that leads to barriers preventing species migration.
					Other

Strategies

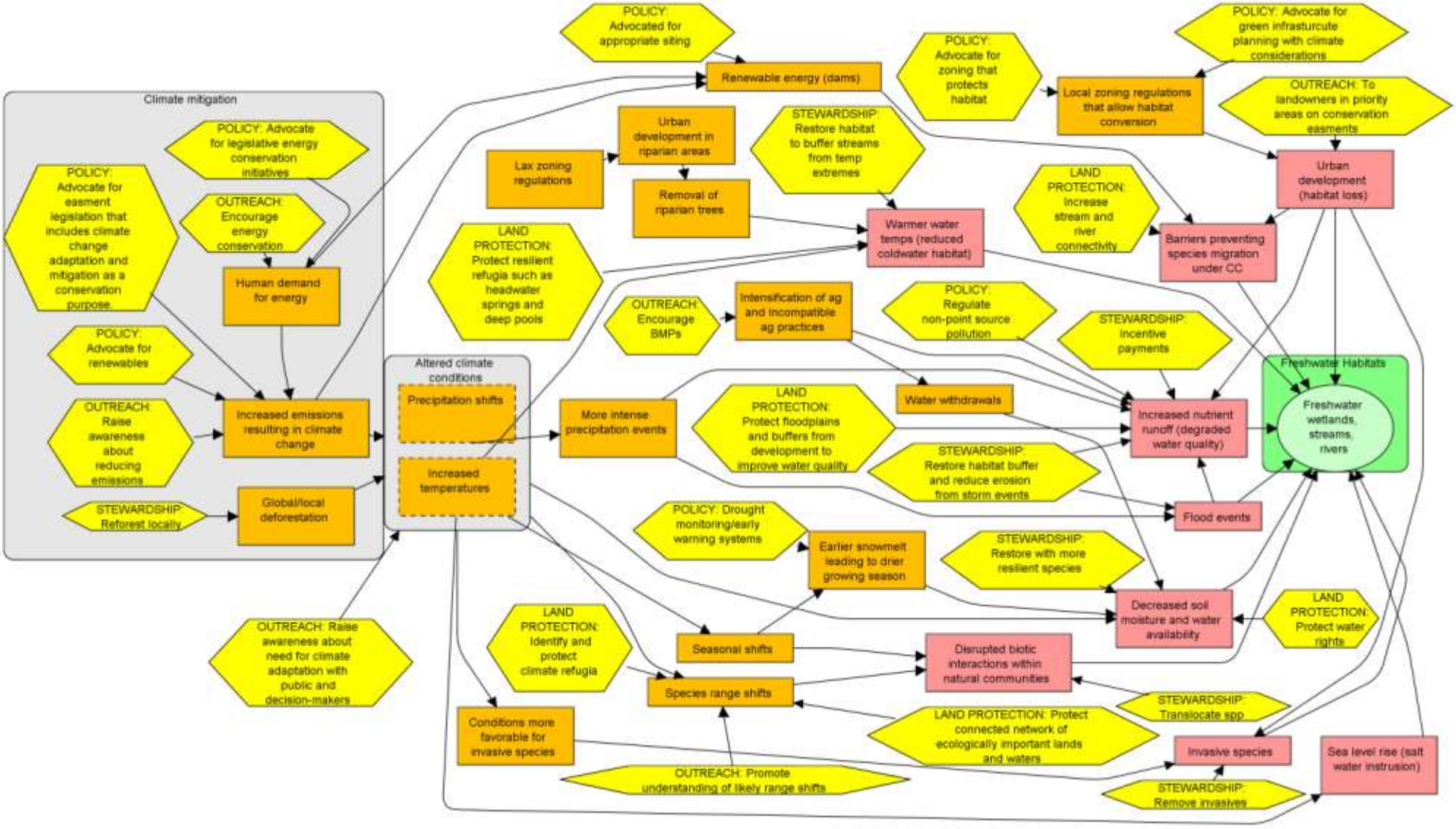
Robust under climate scenarios	Achieve desired outcomes	Social Feasibility	Cost Feasibility	Strategies
				Purchase land or easements to increase stream and river connectivity.
				Promote NRCS Wetland Reserve Program to landowners.
				Protect marshes and buffer from development to improve water quality.
				Identify and protect coastal climate refugia.
				Protect water rights with land acquisitions.
				Remove invasive species.
				Translocate species that won't be able to migrate to suitable habitat.
				Restore habitat buffers to protect from storm surge.
				Remove shoreline hardening and restore natural shorelines.
				Encourage BMPs
				Other:

Outreach and Advocacy

Strategies Ranking

Robust under climate scenarios	Achieve desired outcomes	Social Feasibility	Cost Feasibility	Strategy
				Encourage local energy conservation.
				Raise awareness locally about reducing emissions.
				Raise awareness locally about climate impacts to habitats and the need for climate adaptation with public and decision makers.
				Conduct outreach to landowners on the negative effects of shoreline hardening and encourage natural shorelines.
				Encourage BMPs
				Promote understanding of the likely impacts of climate change on species and habitats in your community.
				Advocate for, participate in, or lead green infrastructure planning or comprehensive planning that takes into account the effects of climate change on local habitats.
				Advocate for local surcharge or tax for development affecting habitats.
				Advocate for local zoning codes that protect areas of existing habitats.
				Advocate for renewable energy development that is appropriately sited.
				Advocate for regulations for non-point source pollution from incompatible agricultural practices and encourage best management practices.
				Advocate for local pervious surface ordinances.
				Advocate for water conservation.
				Advocate for easement legislation that includes climate change adaptation and mitigation as a conservation purpose.
				Advocate for a national energy policy.
				Other:

Situation Analysis for SE Freshwater Habitats



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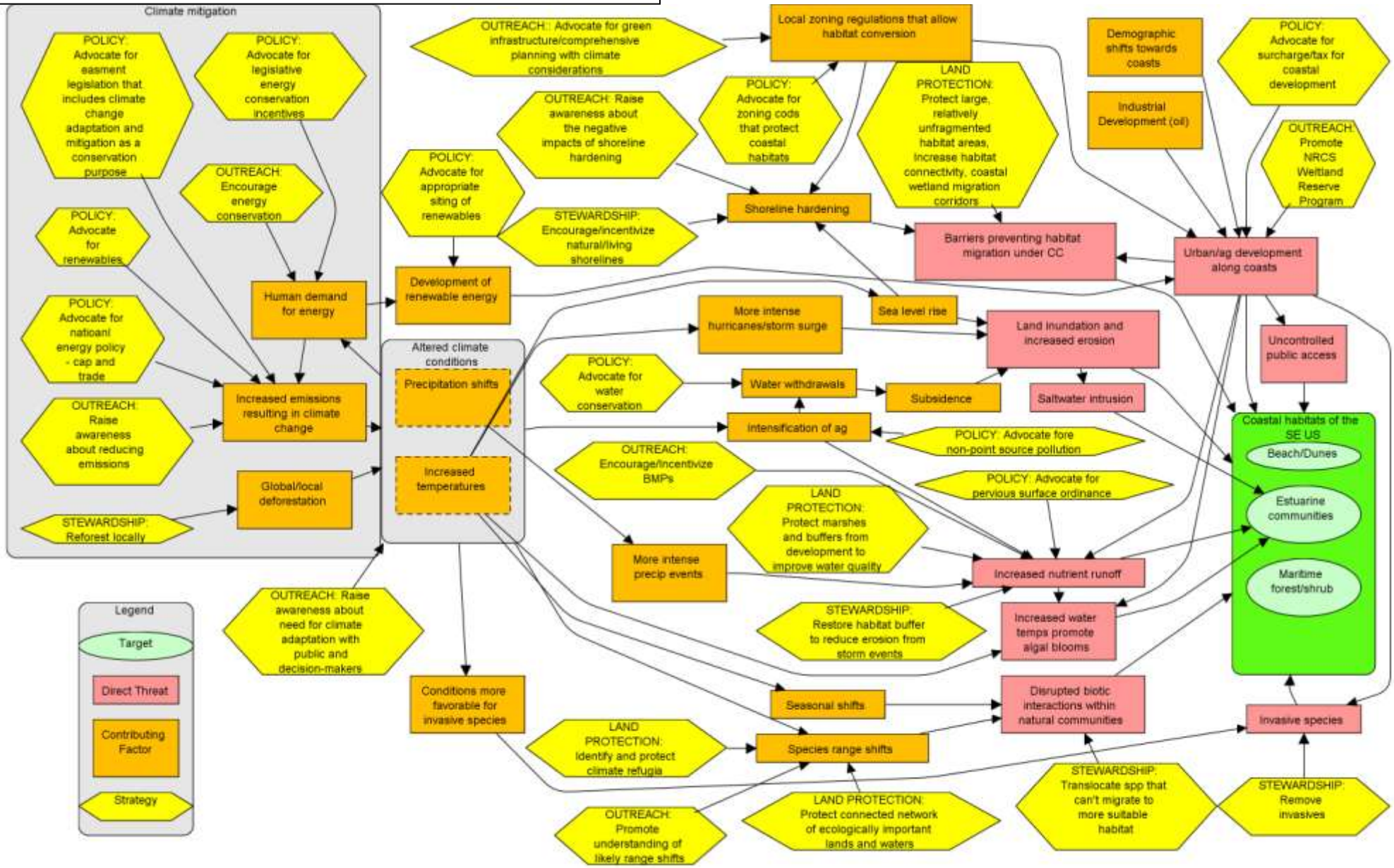
Situation Analysis for SE Coastal Habitats



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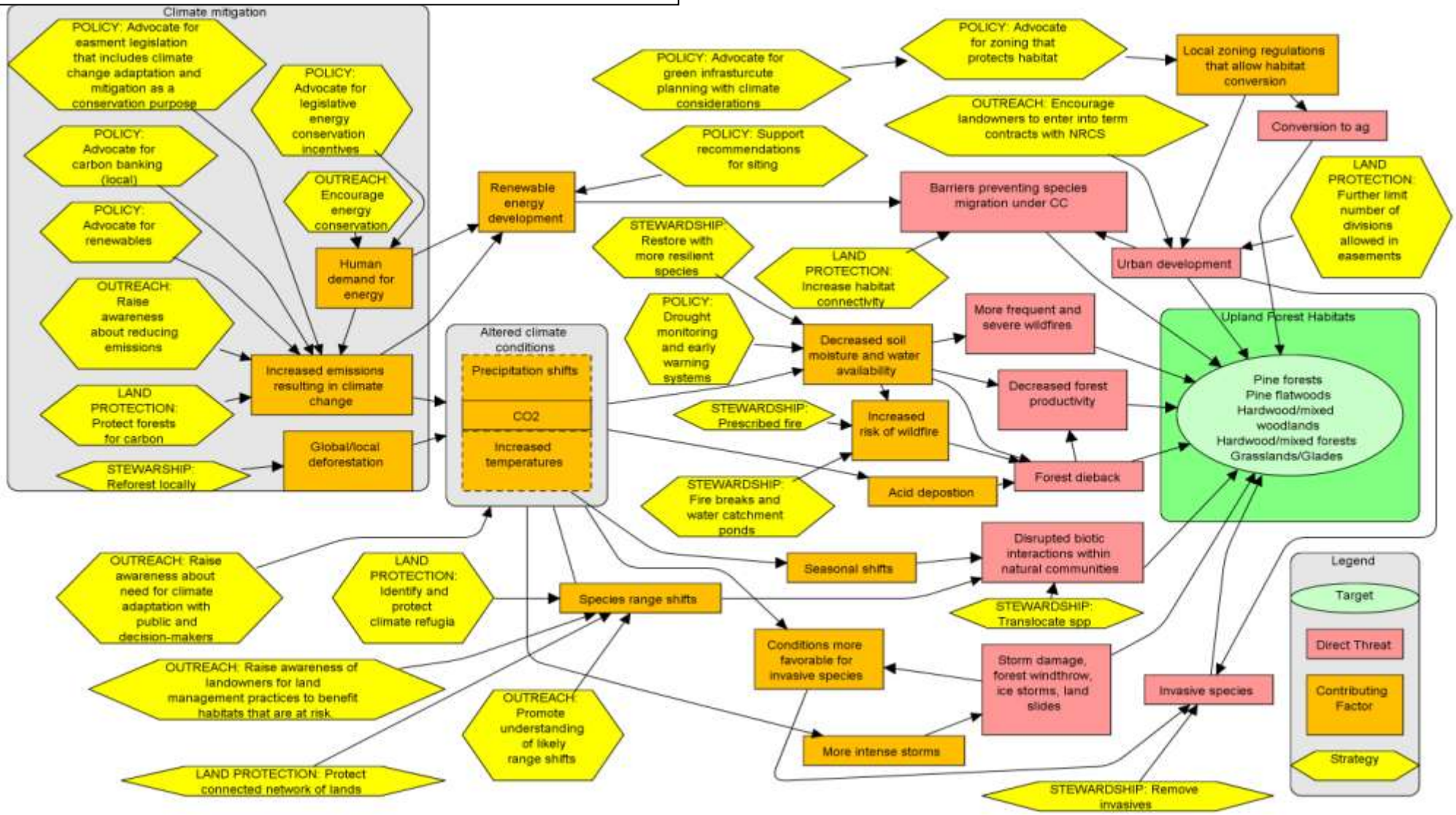
Situation Analysis for SE Forest Habitats



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