

## CHNEP Climate Change Indicators Survey Results

Candidate Indicators	CCMP Problem	Median of 18 Respondants	Average of 18 Respondants
Loss of wetlands attributed to retreating shorelines.	FW	4	3.9
Changes to precipitation trend/patterns	HA	4	3.7
Loss of Conservation Acreage due to sea level rise	FW	4	3.7
Water temperature	WQ	4	3.7
Habitat loss/degradation - salt marshes	FW	4	3.6
Migration/depletion of seagrass beds.	FW	4	3.6
Saltwater Marsh Acreage and Location.	FW	4	3.5
Mangrove Acreage and Location.	FW	4	3.5
Conversion of wetlands to open water.	FW	4	3.4
Drought caused by increased atmospheric temperatures.	HA	4	3.4
Relative sea-level rise	SG	4	3.4
Extreme precipitation	HA	4	3.3
Coastal erosion rates.	HA	4	3.3
Flooding at coastlines.	HA	4	3.2
Habitat loss/degradation - seagrasses	FW	3.5	3.5
Habitat loss/degradation - coastal strand	FW	3.5	3.4
Habitat loss/degradation - mud flats and sandbars	FW	3.5	3.4
Migration of low marsh into high marsh.	FW	3	3.4
Drought intensity	HA	3	3.4
Sea surface temperature Trends	WQ	3	3.3
Timing of seasonal activities (migration, hatching, production)	FW	3	3.3
Drought frequency	HA	3	3.3
Geomorphic changes at the coastline.	SG	3	3.3
Habitat loss/degradation - creek wetlands	FW	3	3.2
Die-offs of sponges, sea urchins, sea grasses (non-mobile) attributed to Increased sea surface temp	FW	3	3.2
Timing of seasonal temperature changes.	SG	3	3.2
Salinity Trends	WQ	3	3.2
Condition of mangrove shoreline.	FW	3	3.2
Ecosystems ranges in the state.	FW	3	3.1
Habitat loss/degradation - oyster bars	FW	3	3.1
Flows, summer	HA	3	3.1
Flows, winter	HA	3	3.1
Maximum temperatures.	SG	3	3.1
Storm frequency and intensity.	SG	3	3.1
Dissolved Oxygen Trends	WQ	3	3.1
Ecologic changes at the coastline.	FW	3	3.1
Amphibian populations' ranges, health, and phenology.	FW	3	3.1
Benthic Macro-invertebrate abundance and diversity.	FW	3	3.1
Habitat loss/degradation - coral ecosystems	FW	3	3.1
Land loss due to coastal erosion	FW	3	3.1
Drought causing lower stream flows	HA	3	3.1
Atmospheric carbon dioxide.	SG	3	3.1
Hurricane intensity.	SG	3	3.1
Sea level rise resulting from increased temperature and expansion of water volume.	SG	3	3.1
Faunal range shifts.	FW	3	3.1
Air temperature trends	SG	3	3.1
Storm surges levels.	SG	3	3.1
Timing of seasonal hydrologic changes.	HA	3	3.1
Hydrologic changes at the coastline.	SG	3	3.1
Seagrass - fall % cover by species, deep edge.	FW	3	3.0
Threatened/endangered species	FW	3	3.0
Changes in rainfall patterns and amounts change agricultural yields.	SG	3	3.0
Sea surface temperatures affect coastlines.	SG	3	3.0
Storm/cyclone frequency	SG	3	3.0
Storm/cyclone intensity	SG	3	3.0
Urban changes due to sea level rise and coastal flooding.	SG	3	3.0
Water depth	WQ	3	3.0
Water table level	HA	3	2.9
Coral bleaching and death of corals.	FW	3	2.9
Wildfires resulting from increased atmospheric temperatures (combined with increased drought)	SG	3	2.9
Habitat loss/degradation - macro-algal beds	FW	3	2.9
Seagrass acreage by seagrass segment	FW	3	2.9
Salinity	HA	3	2.9

Candidate Indicators	CCMP Problem	Median of 18 Respondants	Average of 18 Respondants
Ecosystem services changes due to estuarine water quality.	SG	3	2.9
High tide levels.	SG	3	2.9
Sea level rise resulting from the melting arctic ice sheet.	SG	3	2.9
Chlorophyll-a Trends	WQ	3	2.9
Stratification	WQ	3	2.9
Shift in bird behavior phenology.	FW	3	2.9
Amount of time freshwater flows are within natural seasonal variation for Caloosahatchee R	HA	3	2.9
Amount of time that freshwater flows are within the natural seasonal variation for Estero Tributaries	HA	3	2.9
Amount of time freshwater flows are within natural seasonal variation for Myakka R	HA	3	2.9
Amount of time freshwater flows are within natural seasonal variation for Peace R	HA	3	2.9
Greenhouse Gas (GHG) Emission	SG	3	2.9
Freshwater Wetland Acreage and Location.	FW	3	2.9
Flooding throughout the watershed.	HA	3	2.9
Percent rainfall delivered in rainy season	HA	3	2.9
Hurricane wind speeds.	SG	3	2.9
Bay hypoxia.	WQ	3	2.9
HAB-red tides Trends	WQ	3	2.9
Benthic community diversity	FW	3	2.8
Marine thermal stratification.	SG	3	2.8
HAB-blue-green algae Trends	WQ	3	2.8
HAB-macro-algae & filamentous green algae Trends	WQ	3	2.8
Presence of cold/warm water species	FW	3	2.8
Reproduction measures	FW	3	2.8
Wetland ecosystem services.	FW	3	2.8
Range of marine species	FW	3	2.8
Economic changes due to climate change.	SG	3	2.7
Physical stress of sea level rise on infrastructure.	SG	3	2.7
Habitat loss/degradation - xeric oak scrub	FW	3	2.7
Invasive species ranges.	FW	3	2.7
Native Upland Acreage and Location.	FW	3	2.7
Presence of low-flow/high-flow sensitive species	FW	3	2.7
Winter lake temperatures	FW	3	2.7
Ability of barrier islands to shield coastal areas from higher storm surges.	SG	3	2.7
Basin average interpolated monthly rainfall	WQ	3	2.7
Colored Dissolved Organic Matter (CDOM) Trends	WQ	3	2.7
pH of estuarine waters.	WQ	3	2.7
pH of marine waters.	WQ	3	2.7
Shellfish harvest area closures	WQ	3	2.7
Freshwater Wetland Species Composition for Sample Sites	FW	3	2.6
Habitat loss/degradation - pine flatwoods	FW	3	2.6
Mangrove Species Composition for Sample Sites	FW	3	2.6
Numbers and altered ranges of jellyfish.	FW	3	2.6
Oyster Bay Acreage and Location.	FW	3	2.6
Physical stress of temperature on infrastructure.	SG	3	2.6
Precipitation delivered in heavy and extreme events.	SG	3	2.6
Biochemical Oxygen Demand Trends	WQ	3	2.6
Turbidity Trends	WQ	3	2.6
Amount of protected/restored land	FW	3	2.6
Isohaline locations in 3 rivers.	HA	3	2.6
Disease levels due to climate changes.	SG	3	2.6
Value of urban development at risk for damage a storm can inflict.	SG	3	2.6
Monthly median river discharge	WQ	3	2.6
Insect Community Composition	FW	3	2.6
Submerged and intertidal Unvegetated Habitat extent.	FW	3	2.6
Secchi disk depth Trends	WQ	3	2.5
Total Dissolved Solids Trends	WQ	3	2.5
Fish Community Composition	FW	3	2.5
Dissolved Organic Carbon Trends	WQ	3	2.5
Wind speed and direction	SG	3	2.5
Fecal coliform bacteria Trends	WQ	3	2.5
Specific conductance Trends	WQ	3	2.5
Phenology of pest and beneficial insects.	FW	3	2.4
Enterococci bacteria Trends	WQ	3	2.4
Ground subsidence.	HA	3	2.4
Community diversity	FW	2.5	2.7
Changes to phenology of anadromous fishes.	FW	2.5	2.6
pH of freshwaters.	WQ	2.5	2.6

Candidate Indicators	CCMP Problem	Median of 18 Respondants	Average of 18 Respondants
Ozone levels	SG	2.5	2.6
Sediment transportation/deposition.	SG	2.5	2.6
Air temperature changes affecting animal health.	FW	2.5	2.5
Invasive species	FW	2.5	2.5
Invasive species presence (diversity of species).	FW	2.5	2.5
Nutrients - Organic nitrogen Trends	WQ	2.5	2.5
Nutrients - total ammonia nitrogen Trends	WQ	2.5	2.5
Nutrients - Total nitrate + nitrite nitrogen Trends	WQ	2.5	2.5
Nutrients - Total nitrogen Trends	WQ	2.5	2.5
Nutrients - Unionized Ammonia Trends	WQ	2.5	2.5
PAR (light attenuation, k) Trends	WQ	2.5	2.5
Parasitism levels due to climate changes.	SG	2.5	2.4
Confidence in risk models.	SG	2.5	2.1
Air Temperature at Bartow, Arcadia, Fort Myers	SG	2	2.6
Invasive exotic plant acreage by Basin on public and submerged lands.	FW	2	2.5
Total organic carbon Trends	WQ	2	2.5
Soil temperatures	SG	2	2.5
Nutrients - Total phosphorous Trends	WQ	2	2.5
Nutrients (nitrogen, phosphorous) Trends	WQ	2	2.5
Soil subsidence rates.	SG	2	2.4
Percentage hot days.	SG	2	2.4
Water clarity	WQ	2	2.4
Humidity trends.	SG	2	2.4
Total coliform bacteria Trends	WQ	2	2.4
Exotic Nuisance Animal Reports by Basin on public and submerged lands.	FW	2	2.3
Kilometers of 1st and 2nd order streams	FW	2	2.3
Chlorides Trends	WQ	2	2.3
Number of high pulses	WQ	2	2.3
Soil moisture availability Trends	WQ	2	2.3
Sulfides Trends	WQ	2	2.3
Water color	WQ	2	2.3
Wave height	HA	2	2.3
Area tourist economy.	SG	2	2.3
Mean duration of high pulses	WQ	2	2.3
Sediment toxicity Trends	WQ	2	2.2
Moth phenology shifted to earlier date.	FW	2	2.1
Iron Trends	WQ	2	2.1
Lead Trends	WQ	2	2.1
Sediment contaminants Trends	WQ	2	2.1
Rate of smog formation.	SG	2	2.1
Copper Trends	WQ	2	2.0
USGS Coastal Vulnerability Index (CVI) (see <a href="http://woodshole.er.usgs.gov/project-pages/cvi/">http://woodshole.er.usgs.gov/project-pages/cvi/</a> .)	SG	2	1.9