A BEST PRACTICE FRAMEWORK:

Climate Change and Natural Resource Damages

Updated November 15, 2023

Note to Reader: This document is one of four Best Practice Approach Frameworks presented and discussed at (and subsequent to) the Natural Resources Symposium held in September 2022 at The George Washington University Law School in Washington, DC. See www.NaturalResourcesSymposium.com. Symposium participants were unanimous that the Draft for Discussion Best Practice Frameworks should be made available broadly within multistakeholder law, policy and practice communities. Ongoing Working Groups on this and other topics, coordinated by the Ad-Hoc Industry Natural Resource Management Group, continue to address possible refinements and expansions to the Frameworks and identify additional documents or activities as appropriate. In fact, a multistakeholder Workshop on this Framework and related issues is planned for 2024.

Feedback on this Framework is welcomed. Contact us at info@NRDonline.org with your comments and suggestions, requests to be added to distribution for updates or join our ongoing activities on this important issue.

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Introduction

This document presents a Best Practice Framework for how climate change (CC) is considered in the context of natural resource damage assessments (NRDAs). It assumes advance knowledge of the natural resource damage assessment (NRDA) process as defined in various federal and state statutes and regulations\1. The process outlined here consists of six main steps, each of which is detailed below.

The Framework is intended for multistakeholder use and is aimed at building consistency in practice as to how these issues can be considered. While there are rapidly changing legislative, regulatory and policy requirements related to this practice arena, the fundamental underpinnings and principles of the Best Practice Approach presented here remains constant until and unless there are specific changes in the state-of-the art that require an update.

We first outline the legal and regulatory context when considering climate change in the context of NRDA below, followed by presentation of the Framework and some cost-benefit considerations. Appendix A contains a case example application of the Framework and Appendix B includes additional resources pertinent to the Framework and related issues.

Legal and Regulatory Context

Overview. CC issues relating to NRD \2 will undoubtedly evolve over coming years. **The Best Practice Framework presented below is intended to: (a) guide initial evaluations for specific incidents at specific sites as to whether – and to what degree -- CC and extreme weather events (EWE) effects have relevance to NRD; and (b) whether -- and to what degree -- analyses of these factors should be undertaken.**

NRDAs are undertaken to determine what actions are needed to restore the services provided by natural resources that have been impacted by releases of hazardous substances or oil. There are two sets of federal regulations, both optional -- one focused on evaluation of NRDs relative to hazardous waste sites and the other relative to oil spills. \3

The basic questions in considering climate and extreme weather factors in injury assessment and restoration involve: (a) to what extent should non-release factors (described below) be considered or investigated in specific incidents; and (b) what methods should be used to conduct such investigations.

CC affects the natural environment in two basic ways:

- First, changes in climate introduce elements such as sea level rise and increasing ocean and land mass temperatures, on global, regional, and local scales, which, in turn, impart observable and measurable long-term changes to the environment and the habitats and natural resources therein. Moreover, such changes can

\1 For further background on natural resource damage (NRD) liability and related issues, see www.NRDonline.org, https://darrp.noaa.gov/ and https://www.doi.gov/restoration.

\2 As designated under the Comprehensive Environmental Response, Compensation, and Liability Act of 1990 (CERCLA) or "Superfund", the Oil Pollution Act (OPA) and other federal and state laws. 42 USC 9601, et seq. and 33 USC 2701, et seq. respectively.

\3 See 15 CFR 990 and 43 CFR 11, respectively.

alter human uses of resources and the relative values of various services these resources provide.

- Second, the increasing frequency and severity of EWE attributable to changes in climate (e.g., tropical cyclones, wildfires, extreme precipitation, flooding, storm surges, etc.) cause large episodic and in some cases permanent disturbances in those habitats and natural resources. While changes in climate can result in permanent shifts in physical and biological resources, EWEs result in regional, and more often local largescale upsets, which may or may not permanently change natural resources.

Both changes in climate and EWEs may result in observable and measurable changes in habitats and natural resources considered under the NRDA process - whether OPA or CERCLA driven. Thus, since it is important to measure injury and scale restoration needed as a result of oil or chemical release(s), as adverse changes from the non-release baseline (i.e., "but for"), likewise it is important to consider how those conditions may be influenced by climate and extreme weather factors. These considerations involve likely shifts in the natural resource baseline against which injury and recovery are measured and scaled, as well as treatment of climate and extreme weather factors as "alternative stressors" which may adversely affect natural resources and be mistaken for natural resource injuries.

Further, the same factors affect not only injury assessment, but also are interwoven in the scaling, design, effectiveness, and resilience of restoration projects that are developed to compensate the public for injuries to natural resources and the services they provide. If the overall resource base is affected through time, particularly at CERCLA sites, the relative value of injuries and restoration also changes, undermining the assumptions on which simplified scaling methods such as Resource Equivalency Analysis (REA) and Habitat Equivalency Analysis (HEA) \[4] are based.

While CC and EWE impacts are increasingly becoming a factor in the NRDA process, key questions center on deciding when, and to what extent, analysis of CC and EWE factors in an NRDA is appropriate. Thus, the blend of the application of rigorous science and the practical aspects of coming to fair and equitable NRDA settlements comes into focus as a primary strategic consideration.

Key Laws/Regulations. The profound roles that climate and extreme weather factors may play in an NRDA, both for injury and restoration, imply that decisions must be made as to whether and how to consider climate and extreme weather factors in assessment approaches.

While both OPA and CERCLA regulations include considerations of the natural baseline, in practice, assessments of baseline and information used to determine it are typically not well-specified for either habitats or individual natural resources. While the proper baseline is the "but for" condition that may be changing over time, NRDAs for some oil or chemical releases have relied on historical data for a habitat or resource which may already be outdated due to the temporal gap between the measurement of historical baseline conditions and the incident date. In the intervening years, both climate and extreme weather factors may have significantly affected a baseline (e.g., fish or bird populations and distributions; chemical toxicity due to aquatic temperature changes;

\[4] HEA and REA are methods used to quantify compensation by equating ecological services or species lost due to contamination with those gained through restoration, without directly estimating economic values for losses or gains.

water quality; habitat quality or extent, condition of recreation infrastructure). Given the increasing effects of climate change factors over time, a pre-spill or pre-release estimate of baseline is likely to become increasingly unusable and irrelevant over time, even if the historical data is up to date. Finally, changes in the natural environment after (i.e., OPA) or during (i.e., CERCLA) an incident due to CC and EWE may show that "but for" conditions are non-stationary and that recovery to a pre-spill baseline is never possible. Predicting actual dynamic baselines over the life of the incident and recovery is of augmented importance when CC and EWEs are considered.

In addition to the effect on baselines, climate or extreme weather factors may actually amplify (or mitigate) observed or measured injury. Potential mechanisms include narrowing of temperature tolerances for some species making them more vulnerable to chemical toxicity, reducing the availability of substitutes for recreation which increase the values of trips lost from an event, or completely erasing or making any chemical injury unmeasurable or hypothetical (e.g., if a hurricane completely obliterates a marsh or reef habitat or changes the sediment texture in an intertidal or subtidal resource area).

In a restoration context, climate factors need to be integrated into restoration planning, project design, and resilience planning, due to the same physical and biological factors that affect injury assessments. An added consideration for restoration may be the inclusion of carbon dioxide mitigation, carbon sequestration, and resiliency-friendly elements protective of adjacent non-injured habitat that could be taken into consideration for scaling and restoration credits. When regional baselines are changing, CC and EWE may need to be factored into methods for scaling compensatory restoration.

Influences and state of the practice concerning the Climate Change/NRD interface can be found in the presentations and proceedings of the Group's 2020, 2022 and 2023 Natural Resources Symposia (see www.naturalresourcessymposium.com).

Best Practice Framework

The Proposed Best Practice Framework involves a six-step process to evaluate potential impacts of climate change on NRD liability, assessment and restoration. Optimally, this multi-step process is undertaken as part of a cooperative assessment wherein scientific and economic experts representing both responsible parties (RP) and trustee entities and interests evaluate the details, the merits, and the practicality of considering CC and EWE factors in the NRDA. The result of the application of this multi-step framework then should be an incident-specific plan to conduct such an evaluation.

- The **first step** is the "Incident Analysis", which would consider the nature and complexity of the release, the potentially affected habitats and services they provide, and their vulnerability to CC and EWE factors.
- The **second step** is a "Determination of Applicable CC Factors" that are relevant to the specific incident (e.g., sea level rise; tropical storm frequency; extreme precipitation, trends in ocean temperature; impacts on recreation infrastructure, etc.).
- The **third step**, "Determination of Investigation Intensity" is an outcome of the first two steps. Based on the nature and specifics of the incident, this step

determines if and to what extent CC or EWE factors should be analyzed for their potential influence on baseline and injury. One of three "levels" of inclusion - from no or minimal consideration to rigorous quantitative consideration of climate factors – is determined.

- The **fourth step** "Injury Evaluation" proceeds if the outcome of the third step is to formally consider CC and EWE factors. In this step the evaluation involves how each material CC or EWE will impact each alleged injury.
- The **fifth step**, "Scaling" evaluates the impacts of CC or EWE on scaling of service losses.
- The **final step**, "Restoration Project Selection", evaluates the impacts of CC or EWE on selection, credit calculations and implementation of proposed restoration projects.

Each step and the questions to be addressed is detailed below.

FRAMEWORK STEP	QUESTIONS TO BE ADDRESSED
Step 1: Incident Analysis	• ***What is the nature and complexity of the release; the potentially affected resources, habitats, and services they provide; and the vulnerability of those resources and habitats to CC / EWE factors?*** o Determine whether and with what intensity the incident will require investigation and data collection and how information from those investigations may be used. ▪ The more complex and severe the incident (or when an incident occurs in a geographical area known to be more sensitive to various climate factors), the more climate factors need to be addressed in consideration of baseline, injury assessment and quantification, and in the development of resilient restoration projects. ▪ Alternatively, in those incidents that can quickly assess injury, resolve restoration approaches, and conduct settlement discussions using conventional NRDA approaches, CC and EWE factors are likely to be factually unimportant or of low priority for investigation.
Step 2: Determination of Applicable Potential Climate Change Factors	• ***What are the climate change factors that may impact the NRDA at this particular site?*** o Determine the relevant climate change factors for the given instance (e.g., sea level rise; tropical storm frequency; extreme precipitation; drought trends; ocean temperature trends; land temperature changes; impacts on recreation infrastructure, etc.).

FRAMEWORK STEP	QUESTIONS TO BE ADDRESSED
	◦ Analyze the potential impact these factors may have in the NRDA: a) the frequency and severity of severe storms, resulting in b) extreme precipitation, and c) physical "forcing factors" that can alter habitats and resources therein; d) prolonged temperature variations from norms; e) ocean or land temperature changes. ◦ Determine whether the applicable impacts will have short term, episodic, or long-term effects on the resource(s) and/or habitats, and/or ecological service values. ▪ Short-term and episodic changes can directly affect NRD injury assessments and should be considered as "alternative stressors" to those resulting from the incident itself (e.g., chemical toxicity factors). ▪ Long term changes are those that impact the applicability of baseline data (e.g., resource populations) and determination of the recovery trajectories in scaling analyses such as HEA and REA. *Longer-term climate factors are also especially important in CERCLA-related NRDAs due to the longer term nature of both the contamination inputs, exposures, and recovery periods inherent in CERCLA events.* ◦ Rank the CC and EWE factors in suspected order of importance of their relevance and possible influence on the incident: 1) *critical factors* of clear importance; 2) *non-critical factors* of lesser importance; 3) *factors likely not material* to NRDA elements.
<u>Step 3</u>: Determination of Investigation Intensity	• ***What level of investigation into CC and EWE issues at this site is necessary?*** ◦ Based on the outcome of Steps 1 and 2, determine the level of effort needed to analyze the impact of CC and EWE factors on the NRDA. ▪ *Level 1*: Minimal. Despite possible CC issues and extreme weather disruptions, moving rapidly to a settlement based on other considerations is the best course of action. Potentially, only the restoration project design would include climate resiliency considerations. ▪ *Level 2*: Qualitative. Qualitatively (i.e., using professional judgment based on the literature)

FRAMEWORK STEP	QUESTIONS TO BE ADDRESSED
	consider only a subset of the most critical factors potentially having the greatest impact (e.g., extreme precipitation and land or ocean temperature change) and design literature investigations, analyses, and related low intensity studies to examine those factors. ▪ *Level 3*: Rigorous and quantitative. Climate effects on baseline, injury and restoration would be rigorously and quantitatively researched and investigated (e.g., for complex and large releases with potentially greater injuries to multiple resources occurring in climate/extreme weather vulnerable areas). Each factor would be researched, and probabilistic analysis would be applied within a true casual analysis framework to determine the likelihood of that factor being important.
<u>Step 4</u>: Injury Evaluation	• ***What impact will each material CC or EWE critical factor (see Step 2)have on each alleged injury?*** o Examine each critical factor (i.e., candidate factor), in each specific injury category for causation. o For each critical factor: ▪ Access data on each CC and/or EWE factor ▪ Access data on the chemical (or behavioral in the case of human use) impacts related to the oil or hazardous chemical release – exposure concentration, duration of exposure, toxicity, etc. ▪ Access information from the literature, or in some cases site-specific information, on the effect of each chemical/behavioral effect and each CC/EWE factor on the resource being considered ▪ Access information on ecological or life history characteristics of each resource being considered ▪ Determine the likelihood of each factor playing a role in the injury being assessed ▪ Consider if additional data collection directly focused on the CC or EWE factors needs to be collected.

FRAMEWORK STEP	QUESTIONS TO BE ADDRESSED

<u>Sept 5</u>: Scaling	• ***What impact will CC or EWE factors have on scaling service losses?***
	  • Evaluate whether the changes in baseline due to CC or EWE will sufficiently alter ecological or human-use service values over time such that scaling methods need to be adjusted to accommodate these changes.
	  • If using HEA and REA, consider adjusting the discount rate to reflect changes in the resource base. If using a valuation approach, consider incorporating changing service values directly into scaling.

<u>Step 6</u>: Restoration Project Selection	• ***What impact will CC or EWE factors have on restoration project selection, credit calculations and implementation?***
	  o Evaluate whether CC or EWE could affect the success or longevity of a restoration project
	    ▪ If so, parties may expand the typical nexus between the NRD incident and restoration project, particularly with respect to the location of a project.
	  o Consider CC or EWE in the context of performance criteria development for a restoration project.
	  o Consider alternative geographic locations for restoration projects that have a higher likelihood of successful implementation and sustainability.
	  o Consider additional costs for adaptive management in response to the effects of CC or EWE during restoration project construction and operation, increased costs for monitoring of projects after implementation and potentially a further upward adjustment in the contingency that is typically included in the costing of restoration projects.

Cost-Benefit Considerations

The level of effort devoted to evaluation of CC and EWE factors on NRDA components - baseline, injury, restoration - will be determined by the level of Investigation Intensity (Step 3 above) considered appropriate in each specific case. **This framework and implied process represents a balance between the goal of accurate delineation of climate-related effects and the need for cost-effective and timely resolution of NRD claims.** For example, in a CERCLA claim where historic impacts of a release may span back many decades, it may be desirable to understand how climate-related factors have altered the baseline over that time span, but limitations on availability of suitable data to demonstrate how resources have responded to those factors may make such an investigation impractical. Alternatively, for an oil spill that occurs during an intense phase of an El Niño event, focused collection of data on the impact of the event on biological communities may prove cost-effective in more accurately defining baseline and reducing the magnitude of injury claims.

For restoration scaling, effort spent on forecasting the impacts of future climate-driven changes and EWEs on potential restoration projects may be important for accurately evaluating the relative benefits of different projects. For example, enhanced resiliency to the impacts of sea-level rise may make a seemingly less cost-efficient project more valuable by making projected future benefits more likely to accrue. Demonstrating this could have practical implications for assigning restoration credits to various candidate projects and ultimately to the selection and scaling of the most cost-efficient option.

Summary

This above Framework sets forth a best practice approach for incorporating CC considerations in the context of NRDAs at hazardous waste sites and oil spill sites. It is intended to be used by the different parties at a given site, including PRPs, response agencies, natural resource trustees, and others. **Using this Framework can save time and costs and align NRDA objectives, including desired end points, of the parties involved at specific sites.** While the material presented in this Framework focuses on natural resource issues under US laws, the considerations and proposed solutions herein may also be applicable to natural resource regimes in the UK, EU and other countries.

APPENDIX A
Case Application of Best Practice Approach Framework

HYPOTHETICAL #1: HERON BAY OIL SPILL

On July 1, an undersea crude oil pipeline in the Gulf of Mexico, off the coast of Louisiana, ruptures. Faulty sensors and the failure of a valve results in a substantial release, estimated to exceed 100,000 barrels of oil. A substantial portion of the release reaches the coastline in Louisiana, impacting coastal marshes. Patches of oil and tarballs travel east, along the coastline, and force closures of beaches in Mississippi and Alabama over the July 4th holiday. The rupture of the pipeline also occurs during a year when NOAA has issued Unusual Mortality Event ("UME") warnings for marine mammals in the Gulf.

Recoverable oil is removed from the water within two weeks of the release and shoreline cleanup on the area beaches is completed within three weeks, allowing impacted beaches to reopen by the end of July. Oil stranded in the coastal marshes proves more difficult to remove and response crews are still at work when a Category 5 hurricane impacts the area in early August. The rain, wind, and storm surge associated with this massive hurricane disperse the remaining oil from the release, but also severely impact the coastal marsh habitat, which is increasingly compromised by sea level rise. The hurricane also does extensive damage to the local beach communities and tourism infrastructure, severely reducing recreation in the area. Beach visitation does not return to normal levels until three years post-incident.

Incident responders and the public recover 48 gulf dolphin carcasses in the month after the release. Responding agencies estimate actual losses of dolphins to be 3x this number due to carcasses sinking at sea prior to recovery. Several of the dolphins recovered from the shoreline near the point of the release are partially covered in oil, but it is unclear whether the dolphins encountered the oil while still living or whether the carcasses collected oil after landing on oil impacted shorelines. The state of decomposition of some of the carcasses indicates that their death occurred before the releases. This species of dolphin, listed as an endangered species, is well studied by local researchers who have documented a sharp decline in population over the last three years. Researchers have published papers attributing the decline to an increase in ocean temperature resulting in a loss of prey.

The Louisiana heron, a common species inhabiting the coastal marshes near the release point appears to be the bird species most impacted by the release. Several dozen oiled herons are collected near the release, but experienced responders remark that it could have been much worse, as the heron fledglings had recently left their nests. The hurricane appears to do extensive damage to heron habitat, but counts of nesting pairs the year following the incident appear close to normal, although data on herons in this area is limited.

Amongst the restoration projects favored by local communities is a restoration of critical coastal marsh habitat damaged by the hurricane. Some commenters on the proposed coastal marsh restoration, however, express concern about the viability of this project, arguing that sea level rise is likely to inundate the marshes within 10 years.

Step 1: Incident Analysis – The incident is a large oil release into a complex environment that is influenced by climate and EWE, including ocean temperature fluctuations, sea level rise, and hurricanes.

Step 2: Determination of Applicable Potential Climate Change Factors - *Critical Factors of Clear Importance*

a. Category 5 Hurricane, impacting determination of resource injury and recovery of human use including physical removal of marsh habitat which must be differentiated from injury caused by oil (smothering or toxicity), redistribution of incident oil from physical removal of marshes and flooding associated with the hurricane;

b. Rise in ocean temperature, impacting determination of injury to dolphins and distribution and nesting of birds;

c. Sea level rise, may impact viability of coastal marsh restoration projects.

Non-Critical Factors of Lesser Importance

a. Hurricane impacts on the Louisiana Heron.

Step 3: Determination of Investigation Intensity

Level 3, Rigorous and Quantitative

a. Hurricane impacts on human use and the redistribution and removal of oil;

b. Rise in ocean temperature impacts on the dolphin injury.

Level 1, Minimal

a. Hurricane impacts on the heron population;

b. Sea-level rise impacts on marsh restorations projects.

Step 4: Injury Evaluation

a. Damage to the tourism infrastructure caused by the hurricane will likely impact the recovery of human use resources for years to come, complicating the NRD evaluation. Data on the recovery of human use following similar hurricane events should be considered.

b. Published literature on the decline in the dolphin population as well as data collected during the response indicating not all dolphin carcasses are spill related would be examined.

Step 5: Scaling

a. Human loss uses must consider lost trips from hurricane damage as a baseline. Data from other hurricane events unrelated to oil spills for losses in trips, boating and other recreation including recovery time should be considered in scaling human use related to the spill.

b. Hurricane impacts may dramatically alter the baseline bird populations.

c. Ocean temperature increases also causes scaling issues for dolphin losses springing from injury/causation determination.

d. Restoration projects for human use could have higher credit values for projects also helping recovery from hurricane damage.

Step 6: Restoration Project Selection

a. Selection of coastal marsh restoration projects will be impacted by sea level rise. Consideration should be given to alternate locations or habitats that will be less impacted by sea level rise.
b. Resiliency to hurricane impacts must also be considered when selecting restoration projects.

HYPOTHETICAL #2: COLORADO SOLVENT SERVICES

Colorado Solvent Services (CSS) operated a waste solvent recycling facility from 1975-2020. CSS accepted used solvents from a variety of industries and stored the solvents in several large underground storage tanks prior to processing. CSS is located near the Trout River, separated from the river by a seasonal wetland, beloved by the local bird-watching community and providing habitat for several critical species of bird and amphibians.

Business for CSS was good, so good that it failed to notice that two of its underground storage tanks had developed leaks in the early 1990's. By the time CSS discovered the leaks in 2019, investigators estimate 45,000 to 50,000 gallons of solvents had entered the shallow groundwater table. Initial investigations find that a solvent and heavy metal contaminated ground water plume underlies the adjacent seasonal wetland and appears to have entered the Trout River, contaminating sediment for about 1 mile of the river.

The Trout River basin is in a long-term drought and an increasing percentage of precipitation that the area receives comes in the form of brief, high-intensity rain storms. The flow in Trout River, once a highly productive fishery, drawing anglers from across the state, has significantly reduced during the drought years. There is anecdotal evidence that angler and other recreational visitation at Trout River has declined, but the most recent survey of recreation in the area was performed in the late 1990's well before the drought. The drought's impacts on the seasonal wetland are well-documented by local bird-watchers in a database maintained by the local university. The season that the wetland provides habitat for birds has decreased by 30% resulting in 50% decline in the number of birds that use the wetland.

The remediation plan for CSS calls for excavation and removal of impacted soil from several square miles of the seasonal wetland as well as dredging of Trout River. Until the remediation of Trout River is complete, Colorado Fish and Game has closed a five mile stretch of river to fishing. A groundwater extraction and treatment system is expected to operate for five years and will likely drawdown the groundwater table in the seasonal wetland, further reducing the number of days the area can support wetland habitat.

Restoration projects proposed by local stakeholders include seasonal wetland restoration and restoration of riparian habitat along Trout Creek to improve trout habitat. Some local scientists question whether the drought-lowered groundwater elevation can support wetlands. In addition, lowered stream flows with flash-floods following the high intensity rain events may hamper riparian habitat restoration.

Step 1: Incident Analysis – The incident is a long-term release of solvents impacting groundwater and a 5 mile-stretch of a trout stream. Drought and increase in brief high-intensity rain events has impacted the natural resources and human use.

Step 2: Determination of Applicable Potential Climate Change Factors

Critical Factors of Clear Importance

a. Long-term drought has lowered the water table, reducing the wetlands value as bird habitat.

b. Increased frequency of high-intensity rainfall events may wash away or redistribute contaminants. Remediation must be resilient to prevent redistribution of contaminants.

Non-Critical Factors of Lesser Importance

a. The drought's impacts on human use of the trout stream are less certain.

Step 3: Determination of Investigation Intensity

Level 3, Rigorous and Quantitative

a. Bird population data on the impacts of drought is available for use to determine baseline for this resource, however, consideration should be given to whether the damages to the wetland warrant significant analysis of this issue.

Level 2, Qualitative

a. The impacts of drought and high-intensity rain events on the trout stream habitat may warrant a qualitative review.

Level 1, Minimal

a. Long-term drought impacts on the restoration of the wetlands and trout stream may be considered.

Step 4: Injury Evaluation

a. Available data appears to demonstrate that the drought has impacted the value of the wetland resource for bird habitat, although the drought has occurred during the same period as the release.

b. Data available for recreational use of the stream does not appear to demonstrate that the drought has impacted this resource.

Step 5: Scaling

a. Should ignore the potential impacts of high intensity precipitation events for scaling.

Step 6: Restoration Project Selection

a. The drought may make restoration of the wetlands impacted by release impossible or impractical. An alternate location for wetland restoration may need to be considered.

b. Drought and high-intensity rain fall events will also impact the design of the trout stream restoration. Restoration must be resilient.

APPENDIX B
Resources

By way of example, the following are additional resources.

Websites

- **C2ES (Center for Climate and Energy Solutions)**: About C2ES and Building Climate Resilience Program
- **Environmental Law Institute**: Climate and Energy Program
- **Louisiana State University**: Coastal Sustainability Studio

Government

- **Coeur d'Alene Tribe**: Tribal Climate Adaption Guidebook
- **Department of Agriculture**: 2021 Policy Statement for Climate Adaptation and Resilience
- **Department of Commerce/NOAA**: 2021 Climate Action Plan for Adaptation and Resilience
- **US Department of the Interior**. 2021 Policy Statement for Climate Adaptation and Resilience
- **State of Louisiana**: State of Louisiana Climate Action Plan

Published Documents

- Technologies and policies to decarbonize global industry: Review and assessment of mitigation drivers through 2070", Jeffrey Rissman, et al., Applied Energy, Vol 266, 2020
- "Implications of global climate change for natural resource damage assessment, restoration, and rehabilitation", Rohr, Jason R. et al., Environmental Toxicology Chemistry, 2013
- "Natural Resource Damages for Climate Change - An Idea Whose Time Is Not Yet Come, Part II: Climate Change NRD Claims—Get Coverage", J. Wylie Donald, Ira Gottlieb & Jocelyn Gabrynowicz Hill, Environmental Claims Journal, Vol 21, 2009
- "Natural Resource Damages for Climate Change - An Idea Whose Time Is Not Yet Come, Part I: NRD Claims are Not Currently Viable under CERCLA", Ira Gottlieb, J. Wylie Donald, & Jameson A. L. Tweedie, Environmental Claims Journal, Vol 24, 2008

Note to Reader: We invite your suggested additions and/or corrections to the Resources identified above.