



NATURE-BASED SOLUTIONS IN ACTION

Case Studies from the Environment Program



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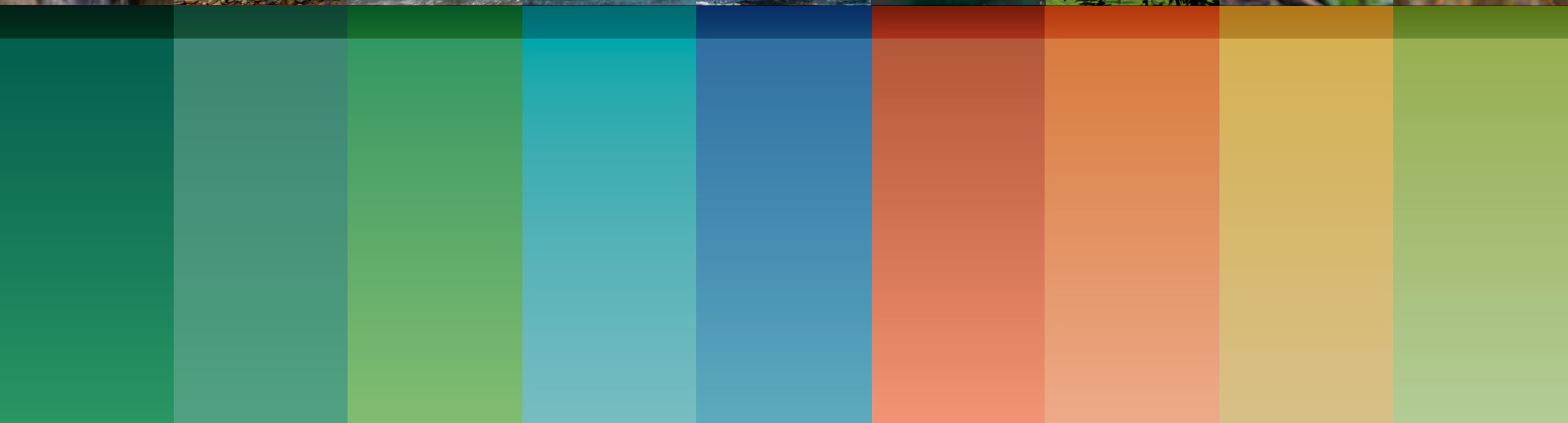
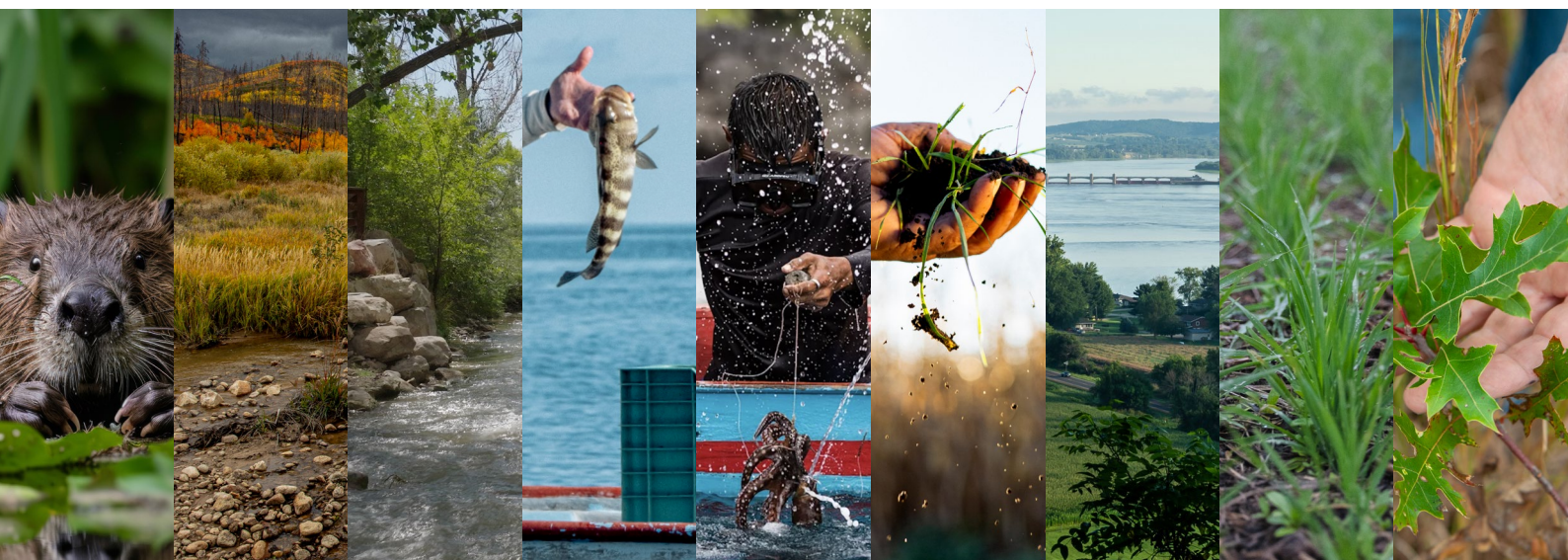


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FOREWORD BY

MOIRA MCDONALD



Nature is something we all share.

It connects us across geography, ideologies and backgrounds. It also provides opportunities for people to strengthen their communities and local economies and to find space for sanctuary. After a hard day, we walk beside the ocean, watch birds in our yard or wander through a forest. When we need to clear our heads, we want to feel a fresh breeze to connect us to something larger than ourselves. When nature is healthy, people benefit, too. Wetlands clean water, healthy oceans feed communities and thriving floodplains help protect against floods and wildfires. An ecosystem in balance protects lives and livelihoods so people and nature can thrive together.

Yet over time, our impacts on nature have grown. Draining wetlands, channelizing rivers and hardening shorelines have added up. Streams are running dry. Marshes are being developed. Fisheries are being depleted. And, at the same time, droughts, wildfires, floods and increasingly destructive storms remind us that climate change is not an abstract future threat. It's here.

The good news is that nature isn't just something we need to protect. It's also one of our most powerful solutions.

What makes working with nature so compelling is that it rarely solves only one problem at a time. Consider a cover crop planted in Iowa over the winter. It holds soil and nutrients in the ground instead of letting them wash into rivers and drinking water supplies. It helps the soil hold moisture through drought. It stores carbon instead of releasing it into the air. One practice and the benefits compound – for the water, for the farm, for the climate and for the community.

Nature-based solutions help people meet the challenges of climate change while also building long-term resilience. From the Alluvial Valley in Mississippi to Helper City, Utah, to the Gulf of Mexico, people are working *with* nature instead of against it and finding ways to grow together.

These case studies are also calls to action. They show us what is possible when people work with nature to create change in their communities. Nature-based solutions work in real places, under real conditions and deliver real results. I am grateful for the expertise, persistence and partnership the humans in these stories bring to this work.

When we look after our rivers, oceans and wetlands, we build resilient communities that can weather tough times. We harness the power of the environment to create jobs and protect our neighborhoods. And we protect the rivers, oceans and landscapes we share.

When we take care of nature, nature takes care of us.

Moira McDonald

Director, Environment Program
Walton Family Foundation





SHUTTERSTOCK

NATURE'S ENGINEERS:

HOW BEAVERS BRING RIVERS BACK TO LIFE

In the high country of western Wyoming, where snow melts into the headwaters of the Colorado River, an unlikely partnership is reshaping the future of water and land management – between conservationists, ranchers and a natural ally: the beaver.

Along tributaries of the Green River, Trout Unlimited (TU) is leading an ambitious effort to **restore degraded wet meadows and rebuild the river's natural floodplain.**

"The problem is, how do we move forward with less water in the system?" says Cory Toye, Wyoming water policy director at TU. "How do we keep habitats, economies, and communities vibrant, and what do we need to do to help all those

stakeholders adjust to an uncertain future?"

The goal is simple, but urgent: help ecosystems and rural communities adapt to a changing landscape increasingly defined by water scarcity and uncertainty. The strategy? Let nature lead.

For nearly two decades, TU has worked with local landowners to identify projects that benefit both

working lands and trout habitat. The approach took a major leap forward a decade ago, with the advent of voluntary water conservation programs and a growing recognition that managing water more naturally could pay dividends across the landscape. Since then, the Green River project has become a model for how nature-based solutions can build resilience in the Colorado River Basin.

The heart of the project is a deceptively simple tool: beaver dam analogs (BDAs). These hand-built structures are made of sticks, rocks and mud that mimic the work of beavers. **They slow the flow of water, encourage vegetation growth and spread water out across the valley floor. The result is greener floodplains, healthier streams and more water held on the land later into the season.**

THE HEART OF THE PROJECT IS A DECEPTIVELY SIMPLE TOOL: BEAVER DAM ANALOGS.

"They're not massive infrastructure; we're not building concrete structures," says Jordan Nielson, a TU restoration expert. "They're temporary by design. These are meant to serve a purpose for a time – and then, hopefully, nature takes its course."

These structures are increasingly recognized as a powerful tool not just for restoring habitat, but for protecting landscapes against wildfires. Healthy wetlands, wet meadows and slow-water systems can retain moisture during dry periods, preventing wildfires from spreading

unchecked. When fires do occur, these same systems can reduce the damage downstream. And when fire-damaged landscapes lead to floods, the beaver dam analogs can regulate water flow.

"We had a stretch of creek where we installed about 300 BDAs downstream of a fire-scarred slope," says Nielson. "Then three monsoon storms came through – each one dropping more and more sediment onto the structures. And over the course of three weeks, it reshaped the valley bottom so it had a flood plain. The effect of having BDAs there reshaped the landscape, making it more connected and more appropriate for what the valley was supposed to be."

That new floodplain will also help prevent future fires in the same area. By adding the BDAs, TU and partners have helped heal fire-scarred areas and made them more resilient against wildfires – mostly by letting water take its natural course.

The bottom line?

"The water did the work for us," says Nielson.

That work matters for a range of stakeholders. For farmers and ranchers, the beaver dam analogs' ability to hold back water can mean better opportunities for late-season irrigation, as well as better forage and improved grazing conditions. For fish, it means cooler, deeper pools and better spawning habitat. For nearby communities, it means improved water quality, since slowing down flows prevents sediment from rushing downstream. For everyone, it means a more resilient watershed.



THE NEW FLOODPLAIN WILL ALSO HELP PREVENT FUTURE FIRES IN THE SAME AREA.

What's happening in the Green River region has implications far beyond the area.

The Green River feeds into Flaming Gorge Reservoir, a key storage system in the upper Colorado River Basin. When water levels in Lake Mead and Lake Powell drop, federal water managers look to Flaming Gorge for supplemental releases. That makes what happens in these headwaters vitally important for millions of people downstream.

"This is a microcosm of what's happening across the basin," says Nick Gann, TU's Rocky Mountain communications director. "The Green River region is home to native trout, agricultural operations and

communities that depend on water. But it's also one of the first places impacted when water shortages hit. That's why the work here matters so much."

For the team, the long-term goal is to use beaver dam analogs to restore a more natural and sustainable ecosystem across the Upper Green and beyond. That might even include reintroducing native beaver populations where feasible, allowing the animals to carry the work forward in ways no human crew could replicate.

"It can sound a little *Field of Dreams*-y," says Toye. "But we're just jumpstarting the process so nature can take its course."



NINA RIGGIO

UPSTREAM SOLUTIONS: PROTECTING WATER FOR THE WEST

In the fire-scarred valley at the headwaters of the Colorado River, a dedicated team is reviving lost wetlands and rebuilding resilience.

Half a century ago, the Kawuneeche Valley in Rocky Mountain National Park was a lush, living sponge. Home to an extensive and vibrant beaver meadow complex, it was covered with rushing pond systems and dense willows that slowed snowmelt and sustained the flow of water through dry seasons, feeding the mighty Colorado River – a source of drinking water for nearly 1 in 10 Americans. But decades of human and wildlife impact, as well as changing river dynamics, degraded the landscape. Over time, as willows

and beaver populations declined, the valley dried and eroded, leaving behind a landscape vulnerable to both flood and fire.

Then, in 2020, the East Troublesome Fire tore through Grand County, scorching forests and sending sediment cascading into the rivers and reservoirs below. Without soggy meadows and healthy beaver-dammed wetlands to hold water on the land, the fire spread unchecked, turning the dry landscape into a conduit for flames.

It was one of two giant wildfires that season that collectively scorched over 400,000 acres of wilderness, leaving the region's ecosystems – and a water supply that reaches 40 million Americans – in peril.

While wildfires are natural – and sometimes necessary for forest renewal – the desiccated landscape supercharged the damage, leaving behind a charred valley even more vulnerable to flash floods and water quality decline.

"It's not like we didn't know there would eventually be fires in our watersheds, but no one envisioned something on that scale," says Esther Vincent, director of environmental services at Northern Water.

THE GOAL IS TO RETURN THE AREA TO ITS LUSH PAST, COMPLETE WITH THE MEADOWS AND WILLOWS THAT USED TO PROTECT THE VALLEY AND REGULATE WATER FLOW.

In the aftermath of the disaster, organizations including Northern Water, The Nature Conservancy, Colorado State University, the National Park Service, Grand County, Rocky Mountain Conservancy and the U.S. Forest Service came together as the Kawuneeche Valley Restoration Collaborative to improve aquatic and terrestrial ecology and protect against future catastrophes.

The goal is to return the area to its lush past, complete with the meadows

and willows that used to protect the valley and regulate water flow. Yet the project isn't being driven by heavy excavation and construction. Instead, it's primarily using the same tools as the beavers who once maintained the valley, and enticing them to return.

The team is building Beaver Dam Analogs, Simulated Beaver Structures and Post-Assisted Log Structures – simple, nature-based methods to intertwine wood and soil to slow water flow and replicate the ecological functions of real beaver dams. These low-tech structures catch sediment flowing down the stream, raise the water table and spread water across the floodplain, encouraging the return of the soggy, willow-lined wetlands. Combined with forest management strategies like targeted thinning in the adjacent national forest, these solutions are rebuilding the region's ability to hold water, resist fire and heal itself.

The beauty of this nature-based approach lies in its simplicity – keeping interventions close to natural elements so ecosystems can maintain themselves. The goal is to draw nearby beaver communities back so that they can move in and maintain the structures going forward. It's a way of helping the ecosystem remember what it was – and begin again.

"It's hard to mess things up too badly when you just put wood and soil in the stream channel," says Jeremy Shaw, a wetland ecologist at Colorado State University and a member of the research team managing the restoration project. "We're trying to use the softest approach possible to accomplish the goal – and the goal is to reinstate natural processes in a self-sustaining way."



“YOU CAN SEE THE DIFFERENCE BETWEEN THIS YEAR AND LAST YEAR... AND IT’S HAPPENING FASTER THAN WE THOUGHT”

These stream restoration techniques aren’t just low-key; they’re also incredibly effective at healing the fire-scarred watershed and transforming it into a living buffer against the next blaze. At a time when wildfires are becoming more frequent, that effort is urgent.

“We don’t have decades to plan for this and then start implementation 30 years from now,” says Vincent. “We need to take action on the ground much faster than that.”

Already, the work is paying off, with hundreds of tons of sediment from fire runoff piling up against the new wood structures and raising the stream beds in some places by two or three feet.

“You can see the difference between this year and last year...and it’s happening faster than we thought,” says Sean Henry, an Environmental Planning Department manager at Northern Water.

Their work to restore the valley has a range of added benefits. By slowing water and reconnecting it with the floodplain, the project also makes the water clean and clear – key issues for millions of downstream users who depend on the Colorado River for drinking water, agriculture and hydropower. Meanwhile, healthy headwaters support everything from municipal drinking water to recreational activities like rafting and fishing. This range of important impacts has made the project popular with an array of local groups and nearby communities, bringing together diverse stakeholders around a shared goal.

“Just knowing that we’re going to be able to do something that cumulatively has a good impact on water quality, water quantity, the environment – it’s a pretty exciting time out there,” says Henry.



WILL SARDINSKY

RESTORING A RIVER REVIVED A TOWN: HELPER CITY HEALS

For 150 years, the Price River in Utah has been heavily used and heavily manipulated. Running through Helper City – an old rail and mining town named for the 19th-century “helper” locomotives that pulled trains and freight up the town’s steep hill – the Price has been adjusted, blocked and dammed up many times to accommodate decades of industrial activity.

// It’s a river that has worked hard for a really long time,” says Trout Unlimited’s Utah State Director Jordan Nielson.

The result of all these efforts to control the river was that the waterway became a twisted shadow of its former self by the 21st century

– muddy, cracked and filled with sediment. In particular, six diversions – including a 12-foot concrete dam – had blocked the river and diverted its flow but were no longer in use. For Helper City, which was navigating a transition to an economy built around tourism and recreation, it was a serious challenge.

"These diversions were just collecting trash," says Nielson. "They were unmaintained and dangerous. People couldn't use the river. It was a bad spot for a small town like Helper City."

In partnership with the town and several other organizations, including RiverRestoration, Trout Unlimited went to work. They removed the old diversions, replacing them with nature-based options like rock crossings to stabilize the river and planted native plants to hold the

banks together. The partnership also performed fish surveys that found that fish had been piling up below the diversions – a clear indication they hadn't been able to go upstream for food and spawning. To address that, Trout Unlimited also made the areas passable to fish in order to expand their access to river habitats. The final phase of the initiative – removing the 12-foot concrete dam – was completed in 2022, on time and well under budget.

"That last phase in particular was a fun one to complete," says Nielson. "When you're out there with a track hoe and a jackhammer and you're chipping away at a dam to allow the river to flow again, that's a pretty satisfying thing – and fun to do."

Today, the Price River is a centerpiece of Helper City. It's teeming with fish, including priority species like the Colorado cutthroat trout and bluehead sucker. The banks are a favorite spot for anglers and community members who can enjoy the river's bounty. Meanwhile, residents of the city frequently use the river for swimming, floating and tubing. Every year, the city hosts an arts festival, and floating down the river has become a central part of the event.

Once again, the Price River flows through the center of Helper City, boosting the town's outdoor recreation economy and making the community a destination. It's been a source of pride for all involved. To recognize the city's efforts, Trout Unlimited presented Helper City with their first Community Action Towards Conservation and Habitat award – or CATCH.

ONCE AGAIN, THE PRICE RIVER FLOWS THROUGH THE CENTER OF HELPER CITY, BOOSTING THE TOWN'S OUTDOOR RECREATION ECONOMY AND MAKING THE COMMUNITY A DESTINATION.



WILL SARDINSKY



REVIVING THE RIVER HAS ENERGIZED THE TOWN, TURNING PAST CHALLENGES INTO OPPORTUNITIES.

"The biggest positive is how the community is interacting with the river," says Nielson.

The experience has been a reminder of how transformative this kind of project can be – and the town is looking to build on the progress they've already made possible. Now that the in-river structures have been removed, Helper City and Trout Unlimited are looking to the banks of the river, and considering ways to make them more amenable to native vegetation and water flow. With many old and outmoded infrastructure projects currently preventing nearby homes from sinking into the waterway, Trout Unlimited is

exploring ways to replace these outdated infrastructure elements with more effective barriers and systems that will stand the test of time.

"There's still a lot of work to do in the town of Helper City," says Nielson. "We're not done – not even close."

That eye towards the future is driving Helper City to new and exciting places. Reviving the river has energized the town, turning past challenges into opportunities. The progress is clear. The momentum is real. As Helper City looks ahead with renewed ambition, there's every reason to believe the best is yet to come.

Environment Program

STRATEGIC OVERVIEW

**We believe that when people care of nature,
nature takes care of people.**

By working with the power of nature, we can reduce the impacts of climate change on rivers, oceans and communities.

Our Approach

We work to support change in our systems so communities, companies, governments, investors and other decision makers focus more on working with the power of nature to protect water – our most precious natural resource.





NINA RIGGIO

FISH REFUGES: PROTECTING FISH, POWERING LOCAL ECONOMIES

Thirteen years after small-scale fishers in Mexico took the bold step of protecting parts of their waters, the results are impressive. Fish are bigger and more abundant, and catches are more reliable. Scarce species are returning and marine life is beginning to thrive again. For the communities that led the way – and the groups that supported them – it's proof that the sea gives back when fishers are trusted to care for their own ocean.

Organizations like Sociedad de Historia Natural Niparajá (Niparajá) and Comunidad y Biodiversidad (COBI) work at the intersection of community-led conservation and fisheries management. Their groundbreaking

efforts to establish networks of fish refuges – marine zones protected from fishing to allow fish populations to recover – have become a model for nature-based solutions that support healthy ecosystems and sustain community livelihoods.

The idea for fish refuges in Mexico emerged in the late 2000s in small-scale fishing communities along the coastline between Loreto and La Paz in Baja California Sur. These were small, tight-knit communities, deeply reliant on fishing for food and income. Local fishers were worried about illegal fishing practices that were depleting resources and a limited ability to safeguard the waters they depended on. At the same time, similar ideas were taking shape elsewhere: Thailand, Malaysia and the Philippines were experimenting with their own type of fish refuges.

“What we heard over and over again is: We are fishers, and we want to continue to fish – but we’re worried about the future of fishing,” says Amy Hudson Weaver, currently a consultant and a longtime collaborator with Niparajá and COBI.

THE SUCCESS OF THE FISH REFUGES HAS SPURRED OTHER COMMUNITIES AROUND MEXICO AND THE CARIBBEAN TO CALL FOR THEIR OWN PROTECTED MARINE ZONES.

The result in Mexico was an effort by COBI and Niparajá to help fishers co-design a legal framework for fish refuges – areas where fishing would be temporarily prohibited to protect habitats, like fish breeding and nursery grounds. After years of grassroots organizing and collaboration with government

agencies, the first official network of fish refuges in Mexico was established in 2012. Eleven zones were voluntarily closed to fishing for five years – an unprecedented move driven by local initiative, not by regulation.

That community involvement has been crucial.

“You can’t just parachute into a community, design a project and leave,” says Stuart Fulton, COBI’s director of development. “You need to trust the fishers and the communities, and they need to trust you.”

Niparajá and COBI trained local fishers and their family members as underwater and on-land monitors, equipping them to track changes in fish populations and document catch data – information that had never been systematically collected before.

“It became a huge project with fishers,” says Weaver. “We were training people to monitor the catches, to count what they caught, to monitor the different species being caught. We were able to establish a baseline and understand changes over time to see if it was working.”

In 2017, when the first five-year period ended, the communities decided to renew all the original refuges. They even expanded some areas and added new ones. In 2022, additional adjustments were made to further strengthen the network. Recently, Mexico’s federal government announced plans to more than triple its fish refuge zones by 2026, recognizing the power of these community-led efforts to achieve national conservation goals.



NINA RIGGIO

WHAT MAKES THE PROJECT PARTICULARLY INSPIRING IS ITS GENERATIONAL IMPACT.

The success of the fish refuges has spurred other communities around Mexico and the Caribbean to call for their own protected marine zones, and to ask groups like Niparajá and COBI for help with the process. Yet as Fulton emphasizes, the most effective ambassadors for the new sites are fishers who have seen what communities with fish refuges can accomplish together.

"Fishers with current fish refuges have been key in communicating to new sites the benefits of refuges, how to design them and how to operate them effectively," says Fulton. "They've really bought into the process." What makes the project particularly inspiring is its generational impact. Community members who were children when the early refuges were first established are now young adults, aspiring to join dive teams and continue conservation work. The concept of marine protection

has become embedded in the local identity – not as something imposed from the outside, but as a community-driven solution.

"These kids have grown up with the fish refuges since they were 8 years old, and now they're in their 20s – and they're like, when I grow up, I want to be part of the dive team [monitoring the refuges]," says Weaver. "This conservation culture is built into the community."

By closing these areas to fishing for a short time, with the support of fishing communities, the ocean has bounced back. The fish targeted by the fishers are increasing in number and getting bigger. The health of the ecosystem is improving, and the productivity of the fisheries is too. Today, the fish refuges are more than protected waters; they are living proof that communities can safeguard their livelihoods and leave a healthier ocean for the next generation.



FROM TIDE TO TABLE: COMMUNITIES RESTORING BALANCE BENEATH THE WAVES

Hugging the coast of Indonesia, shallow reef zones and seagrass beds teem with life. These nearshore waters – dense with biodiversity – are home to a critical species: the octopus.

Octopus is a keystone species in these ecosystems. As predators, they help keep populations of crabs, mollusks and other invertebrates in check, preventing the kind of overgrazing that can devastate coral reefs and seagrass meadows. As prey, they sustain a wide range of marine animals, from reef fish to dolphins. Maintaining healthy octopus populations is essential to preserving the intricate balance of coastal marine ecosystems.

They're also critical to the local seafood processing and exporting economy – and vital to coastal communities that rely on them for livelihoods and as a primary source of nutrition. **But overfishing and destructive practices that harm the coral reefs where octopuses live threaten to deplete their population – throwing delicate animal and human ecosystems out of balance.**

Today, local communities are forging a more sustainable path. One of the most promising tools: temporary fishery closures. These locally-led efforts restrict octopus harvesting in certain areas for a few months, giving octopus time to grow larger and reproduce. The result is more abundant fisheries, healthier reefs and strengthened community stewardship of marine resources.

The benefit of this approach lies in its connection to the community. Octopuses are typically harvested by small-scale fishers; they grow quickly, have short life cycles and tend not to stray far from their dens. That means when fishing is paused, octopus populations can recover rapidly. The communities that enact protective measures are the first to benefit.

BY TAKING CARE OF THEIR LOCAL COASTLINES, COMMUNITIES CAN SUPPORT AN ABUNDANT, DIVERSE ECOSYSTEM OF MARINE LIFE.

Blue Ventures is one of the partners working with communities to support and expand locally-led closures – and already, results are visible. With pauses in fishing timed to match its life-cycle, octopuses are being given the time to grow to maturity. That means more are reproducing and populations are replenishing. There are more full-sized octopuses available to be caught – a boon to fishers. It's a chance to step back and let nature heal itself.

Blue Ventures is excited not only about the opportunity to restore economies and ecosystems, but also about the way communities are taking the lead. According to Steve Box, Blue Ventures' chief programs officer, the effort ensures communities own the process of building a sustainable system. Instead of a top-down approach that mandates requirements for sustainability, the initiative supports coastal communities that lead the effort. It's a more effective approach for isolated areas where much of this octopus fishing takes place.

"These are local communities making decisions and implementing them," says Box. "You don't have to use a centralized model and build out top-down enforcement and compliance. There's incredible power in enabling communities to collect information and build structures and regulations that are appropriate for local fisheries and understood at a community level."

According to Box, efforts like this one demonstrate how tightly connected humans are to the ecosystems around them and that management and conservation go hand in hand. By taking care of their local coastlines, Box says, communities can support an abundant, diverse ecosystem of marine life. That ecosystem, in turn, can feed the community and support its economic engine. It's a virtuous cycle. When communities care for marine ecosystems, those ecosystems become more resilient and productive, in turn sustaining the very people who depend on them. That's what makes the relationship not just important, but essential.



OCTOPUS ARE AN ENTRY POINT TO CATALYZE THIS PROCESS ACROSS OTHER FISHERIES.

This is a model that can transfer beyond octopus. The social cohesion and understanding built through establishing temporary octopus closures are the same processes that are needed for community-based management more broadly – to come together, discuss issues, develop a locally-appropriate plan, implement it through community efforts, and collect the data to measure success, refine and adapt.

Octopus are an entry point to catalyze this process across other fisheries. Communities are able to see the results of their collective effort within a relatively short timeline. This provides a clear proof-point that they are not simply passive witnesses of environmental decline, but are powerful agents of change. With that realization, the same social mechanisms they have been applying can be expanded to other fisheries and broader habitat conservation

efforts. This is already happening as communities initially involved in the octopus work are extending their community-based management to other fisheries that are important to them, and fully recognizing the tight connection between protecting habitat and their fisheries' success.

"These are clearly nature-based solutions – using the power of nature to support and reinvigorate a community, and using the power of a community to support and reinvigorate nature," says Box. "We can't manage nature in isolation. These communities are the custodians of these areas, and these areas are the custodians of these communities."

For Box, the people represent the greatest opportunity and the greatest hope for regenerating coastal ecosystems and reversing current declines – now, and in the future.



ROOTS THAT HOLD, SEEDS THAT SELL: HOW FARMERS ARE RETHINKING WHAT FILLS THE FIELDS

Farmers have long used cover crops to protect soil between growing seasons, and today many are exploring new approaches that build on this practice to meet changing environmental and economic needs.

In Iowa and Minnesota, new approaches are emerging that build on the idea of keeping roots in the ground year-round. Some farmers are overlapping cash crops to strengthen soil and reduce flooding, while others are testing winter-hardy plants that protect fields and can also be harvested. These innovations—relay cropping, multi-cropping and planting winter-

hardy crops—show how cover crops are being adapted to provide more benefit to the land and the people who depend on it.

How can farmland not only produce crops, but also provide a wide range of benefits such as reducing flooding and improving water quality? This case study highlights two initiatives that explore this question.

THE AMERICAN FLOOD COALITION: Quantifying the flood reduction benefits of relay cropping in Iowa

The American Flood Coalition (AFC) is working with local farmers in Iowa to explore how a centuries-old agricultural practice called “relay cropping” can fight one of today’s most pressing challenges: flooding.

With half of U.S. land in agricultural production and 1 in 5 Americans living in rural areas, flooding can devastate agricultural land and communities downstream. AFC’s project explores how planting a second crop before the first is fully harvested – sometimes referred to as “multi-cropping” and “relay cropping” – can strengthen root systems, improve the soil’s ability to hold water and reduce flooding.

The approach is simple but powerful: Plant multiple crops to increase root density and the soil’s ability to hold more water. When multiple crops share a growing season, their combined root systems create a soil structure that can take in and retain more rainfall. This not only reduces runoff and erosion but also improves soil health and water quality by keeping nutrients and organic matter in place. Relay cropping can also offer biodiversity gains, more consistent crop yields and long-term economic opportunity – showing that what benefits ecosystems can also support farm economies.

Relay cropping has been used in some form for centuries – but there’s very little long-term data to quantify how effective it is when it comes to alleviating floodwaters. That’s something AFC is working to change, in close collaboration with farmers like Loren Steinlage of FLOLO Farms, and partners including the Iowa Flood Center and Northeast Iowa Resource Conservation & Development.

“This pilot project is one of the first to quantify the flood reduction benefits of relay cropping,” says Baker. “We measured how much additional water the soil can hold when crops overlap, building the evidence base for what farmers have seen anecdotally for years – that more roots in the soil means less water running off the land. The reality is we don’t have decades of data – so it’s a process of trying it out, monitoring it, and informing the next iteration over time. The process of measuring the outcome is extremely important.”

SLOWING WATER DOWN
AND STORING IT IS VITAL FOR
REDUCING FLOODING – AND
PLANTS ARE AN INCREDIBLY
EFFECTIVE WAY TO DO THAT.

“When you overlap crops – planting the next one before the first is harvested – you have more roots in the ground, and for longer,” says Anne Baker, chief program officer at AFC. “This overlap increases root density, which reduces erosion and helps the soil hold more water. Slowing water down and storing it is vital for reducing flooding – and plants are an incredibly effective way to do that.”



RELAY CROPPING CAN HELP REDUCE FLOODING DOWNSTREAM IN THE WATERSHED BY UP TO 30%.

Already, they've found some preliminary answers. According to AFC, relay cropping can reduce farm flooding, boost farm profits by \$50.90 per acre and improve soil health and water quality. But perhaps even more eye-catching is that AFC's latest research has found that relay cropping can help reduce flooding downstream in the watershed by up to 30%. That's in addition to reducing peak runoff during storm events, which means more water being absorbed into the ground where it falls, and less water spilling out over farmlands into homes and communities.

That number represents a real and vital impact. According to AFC, if farmers had been using these approaches during the devastating 2016 floods in Cedar Rapids, Iowa, they could have prevented up to 2.8 million gallons of water from rushing through Cedar Rapids every minute. Ultimately, more than 400 acres – and nearly 500 homes and

businesses – could have been further protected from the flooding. It's a powerful example that quantifies the benefits of approaches like relay cropping – not only for land management, but for protecting homes, livelihoods and entire neighborhoods.

THE FOREVER GREEN INITIATIVE: Replacing traditional cover crops with winter-hardy crops for harvest

AFC isn't the only organization working to boost multi-cropping in a way that supports farmers, communities and ecosystems alike. In Minnesota, the Forever Green Initiative is bringing together researchers and farmers to develop cover crops or winter-hardy crops that can also be harvested by farmers – giving them more opportunities to sell crops while also improving water quality and soil health.

"To most people and most farmers, a cover crop is something you plant, but you're not trying to harvest it. That's what distinguishes a cover crop from a cash crop," says Forever Green Initiative's Co-Director Mitch Hunter. "But, no harvest means no income. That's why we're developing winter-hardy crops that give all the benefits of cover crops and also have economic value."

The need is urgent. In Minnesota, adoption of traditional cover crops remains under 3%, largely because the learning curve and cost can sometimes limit short-term return. That's why Forever Green is developing a portfolio of 15 winter-hardy crops – like winter-hardy annuals and perennials – that grow in the off-season. They keep soil covered year-round and can be integrated into rotations with conventional crops. It's a regenerative, nature-based approach that provides both ecological benefits and economic incentives.

"IT'S TRYING TO RETURN TO A LANDSCAPE THAT IS MORE DIVERSE AND MORE LIKE NATURE".



One example is a winter annual oilseed crop that was considered a weed just a decade ago. Now it's being domesticated for commercial use, offering both environmental benefits and market potential. These new crops can reduce nutrient runoff, improve water quality and even provide pollinator habitat – all while fitting into existing agricultural systems.

Forever Green's work is rooted in a surprisingly simple idea: returning agriculture to a more natural rhythm.

"It's trying to return to a landscape that is more diverse and more like nature," says Director of Partnerships and Outreach Ann Kirby. "Bringing nature from the landscape into the field, and trying to make the field look more like the natural landscape than it has in the last 80 years."

Still, making this vision a reality is complex.

"We do a lot of work on plant breeding – making these crops that perform better for farmers – but then you have to get seed production going, bring farmers onto it, figure out the markets and overcome regulatory barriers," says Hunter. "It's a chain – and if the chain breaks at any point, you can't move forward."

That's why partnerships are crucial. Forever Green works with farmers, startups, established companies, state agencies and nonprofits to bring these crops from research plots into the real world.

"Everybody wants this to work," says Kirby. "Philanthropy, farmers, environmental NGOs, state agencies, industry. There's a lot of people rooting for us."

The Big Questions of Our Work

Nature has the power to heal itself and take care of people if we let it work.

We are asking big questions alongside grantees and communities about protecting water in the face of climate change.



SUPPLY CHAIN

How can we incentivize companies to take greater responsibility for nature?



WATER POLICY

How can we find solutions so that people and communities have water to thrive?



INNOVATIVE IDEAS

How can we empower communities to bring new ideas around nature and water to decision makers at all levels?



SMART FINANCE

How can we find innovative ways to help pay for the work that needs to be done?





FROM THE EDGE OF THE FIELD TO THE HEART OF THE RIVER: SCALING WATER SOLUTIONS FOR FARMERS

Iowa is built on agriculture. But as the state has grown, human activity has impacted its waterways – affecting drinking water, natural ecosystems and soil health. Through a range of nature-based projects, organizations like the Great Outdoors Foundation are seeking to reverse that change by helping communities and landowners adopt water management practices that support both agriculture and ecosystems.

“Many streams in Iowa are experiencing erosion, poor water quality and habitat loss,” says Great Outdoors Foundation Senior Project Manager Melissa Campbell. “Stream restoration or rehabilitation, especially in urban areas, can be challenging due to existing site

constraints, limited funding and conflicting stakeholder priorities. We may not be able to restore streams to their pre-development condition, but we can make improvements that restore natural river processes, which can improve water quality, reduce sediment loads and restore habitat.”

Historically, one of the greatest barriers to implementation has been funding. Without the money to make critical up-front investments, efforts to create long-term change can be difficult to get off the ground. Securing funding for a series of independent projects is especially difficult due to cost. That's why partners in Iowa are using a "batch and build" approach that combines similar projects into a single bid package. This results in an economy of scale – the overall cost goes down when several projects are combined, compared with the cost to complete each project individually. It also allows for several projects to be completed at once and for those water quality and quantity benefits to be realized sooner than if they were implemented one project at a time.

"The concept involves combining multiple projects into one bid package," says Campbell. "The batch and build concept simplifies and speeds up the process, and reduces the overall cost when compared to soliciting bids for each project individually."

Currently, the batch and build concept is being used to implement "edge-of-field" practices. These projects are constructed on the perimeter of agricultural fields to manage water runoff. Designed to capture and filter excess nutrients and sediment from agricultural land before they reach waterways, the practices can improve soil health, provide flood storage and improve water quality. Edge-of-field practices are cost-effective and don't require much maintenance after they've been installed.

For Campbell, the term "nature-based solution" isn't used often, though it is becoming more common. However, the concept is being implemented across Iowa, she says, through projects that use natural systems to manage water-related challenges instead of hard infrastructure.

"It's about incorporating natural features and processes into our projects," says Campbell.

What do those projects look like?

In some cases, they involve restoring wetlands – critical areas that filter pollutants, reduce soil loss and mitigate flooding. In others, they restore floodplains along streams, reconstructing the area to serve the same function it served before it was altered by development.

THE 'BATCH AND BUILD' CONCEPT INVOLVES COMBINING MULTIPLE PROJECTS INTO ONE BID PACKAGE.





WHAT MAKES THE PROJECT PARTICULARLY INSPIRING IS ITS GENERATIONAL IMPACT.

One proposed oxbow restoration project in eastern Iowa, located in the floodplain of the Middle Cedar River Watershed, will capture 250 acres of agricultural runoff. This project will absorb nutrients and filter out pollutants before they enter the Cedar River.

To achieve these results, partners like the Great Outdoors Foundation work closely with farmers and landowners – implementing edge-of-field practices to capture runoff and supporting waterway management on their properties.

“A lot of farmers and producers out there are hesitant to implement cover crops or edge-of-field practices due to a lack of understanding of the practice and an assumption that it will negatively impact their bottom line. That isn’t necessarily the

case,” says Campbell. “So if we can tackle that issue and show them the benefits, such as reduced soil loss, and that they aren’t necessarily going to see that lost revenue, it will go a long way towards convincing them to adopt these practices.”

Once farmers are on board, the most effective way to expand projects is by encouraging them to connect and share their experience with other farmers and landowners in their community.

“Most counties have at least one farmer utilizing these practices,” says Campbell. “If they can share their experiences with those practices with another farmer they know, the second farmer is more likely to implement these solutions. It’s a lot of reaching out to people, and seeing what we can do together.”



THE GREEN IN THE GROUND:

HOW FINANCE IS FUELING SUSTAINABLE FARMING

In the rolling fields of the American heartland, a quiet transformation is underway – one that starts not with the soil, but with the farm loan.

For decades, the decision to adopt regenerative practices like cover cropping, reduced tillage and nutrient efficiency has fallen squarely on farmers' shoulders. While the benefits of sustainable farming solutions are clear – healthier soil, better yields and lower emissions – the initial costs can be a tough pill to swallow.

"When we're talking about regenerative agriculture, a lot of these practices can help farmers become more resilient and more profitable in the

long run," says Maggie Monast, senior director of climate-smart agriculture at Environmental Defense Fund (EDF). "But there's often a shorter-term transition that can be hard for the farmer to overcome on their own. That's why we're trying to build the inherent value of regenerative agriculture into the way that financing works."

Monast leads EDF's work with agricultural lenders and finance institutions, aiming to bridge the gap between sustainable practice adoption and farm economics.

In recent years, that mission has taken shape through two groundbreaking initiatives that put farmers – and the environment – on stronger footing.

The first is the Regenerative Agriculture Financing Program, a collaboration with Farmers Business Network (FBN). The concept is simple but powerful: **Reward farmers financially for adopting regenerative practices that improve soil health and reduce nitrogen fertilizer runoff.**

“Farmers who meet performance standards for soil health and nitrogen efficiency receive a half-point rebate on the interest rate of their loans,” says Monast. “It’s the first loan of its kind in the U.S. to directly link sustainability with financial rewards for farmers in this way.”

The response was swift. When the \$25 million pilot launched in 2022, it sold out within weeks. Farmers in 18 states, from Georgia to North Dakota, enrolled. The program’s appeal cut across geography and farm size, signaling a broad appetite for financing tied to sustainable practices.

According to Monast, embedding rewards for sustainability in financing is a win-win-win. It helps farmers overcome initial hurdles to more sustainable agriculture, builds more resilient farms and makes farmers better borrowers, while promoting the health of natural ecosystems, economies and communities. Because lenders and farmers already have trusting relationships, they can work together effectively to produce positive outcomes.

“Farmers rely on ag lenders to finance their land, equipment and annual operating expenses,” says Monast. “Those lenders tend to be some of farmers’ closest financial partners and most trusted advisors.”

EDF’s second major initiative, a sustainability-linked loan with CoBank and Heartland Co-op, shows how lenders can incentivize sustainability at scale.

CoBank is the largest member of the Farm Credit System, which provides nearly half of all U.S. agricultural credit. It financed Heartland Co-op with a loan that reduces interest rates if the co-op hits specific environmental targets. These include nature-based solutions such as expanding cover crop adoption, implementing water quality solutions like bioreactors and increasing farmer engagement.

EMBEDDING REWARDS FOR SUSTAINABILITY IN FINANCING IS A WIN-WIN-WIN.





BECAUSE LENDERS AND FARMERS ALREADY HAVE TRUSTING RELATIONSHIPS, THEY CAN WORK TOGETHER EFFECTIVELY TO PRODUCE POSITIVE OUTCOMES.

Heartland, which buys grain from farmers and sells them supplies, has a conservation agronomy program that puts boots on the ground to support farmers in adopting sustainable practices.

The CoBank-Heartland loan is especially significant because of its scale. For Heartland's line of credit, even a small interest rate reduction translates into big savings and a powerful incentive to deliver on sustainability goals.

Ultimately, the plan is to create a shift towards holistic solutions that make it easier for farmers to access the financing they need to adopt new practices.

"The status quo is very ad hoc and reactive," says Monast. "If the farmer can figure out how to make the

economics work, great – the lender will find a way to help them do it. But we've been working to help lenders think about this strategically, and be more proactive in offering products to farmers that can help them through the transition."

Rather than cobbling together multiple sources of funding, farmers can come to their lenders for an integrated approach delivered by institutions they already know and trust.

"We're moving from individual farmers piecing together different and frequently incompatible sources of funding and finance, to a holistic package that is delivered through their existing business relationships," says Monast. "That's the huge value-add of this."



RORY DOYLE

ROOTED IN RENEWAL: RESTORING THE VALLEY

In the rich, flat floodplain of the Lower Mississippi River, the soil has always been fertile – but not always forgiving. For decades, farmers cleared forests and drained wetlands to cultivate low-lying lands prone to constant flooding, often planting soybeans. Yet even today, some tracts remain unproductive.

"A certain amount of that farmland is marginal, and it's hard for farmers to make a profit," says Ronald Seiss, Lower Mississippi River program director and coordinator of the Tri-state Conservation Partnership working across Arkansas, Louisiana and Mississippi. "It's an excessive wetness problem."

That wetness, historically a problem, is now at the center of

an effort to restore the valley's natural floodplain functions while improving water quality across the region and beyond. Through the USDA's Wetland Reserve Easement (WRE) program, administered by the Natural Resources Conservation Service (NRCS), landowners are voluntarily placing conservation easements on marginal cropland, allowing restoration teams to replant native trees and reestablish wetlands.

Over the past 33 years, more than one million acres have been enrolled across the Lower Mississippi Alluvial Valley, converting farmland back into vibrant wetlands and hardwood forests.

A key benefit of the program? Farmers are not being asked to sacrifice productive land in the name of conservation.

"Farmers don't have to enroll their entire land ownership – just the unproductive part," says Seiss. "We like to say, 'farm the best and conserve the rest.'"

The impact is profound. By taking unproductive land out of rotation, the initiative reduces the amount of fertilizer used in the region.

FARMERS ARE NOT BEING ASKED TO SACRIFICE PRODUCTIVE LAND IN THE NAME OF CONSERVATION.



Meanwhile, the restored wetlands hold water during floods, creating habitats for everything from migratory birds to pollinators. They also filter runoff from nearby farmland, capturing sediment and agricultural nutrients like nitrogen and phosphorus before they reach rivers.

The benefits ripple far beyond the region. Fertilizer runoff from farms in the Mississippi Valley is one of the largest contributors to the hypoxic "dead zone" in the Gulf of Mexico – an area the size of a small state where oxygen levels are too low to support marine life. Wetland restoration offers one of the most effective ways to slow that pollution at its source. By taking marginal farmland out of production and letting wetlands filter the existing runoff, the program is reducing the amount of nutrients flowing into the river – cleaning up the water before it gets to the Gulf.

"People think of this as a habitat program," says Seiss. "But it's also nutrient reduction, floodwater reduction, water quality improvement and carbon sequestration. All of that is as important as the habitat it's creating."

According to Seiss, the approach is not just environmentally sound – it's practical. Farmers get paid to stop working land that was costing them time and money. The government saves on commodity programs, crop insurance and disaster assistance payments on unproductive land. The landscape becomes more resilient to flooding and drought, and the public benefits from cleaner water and stronger ecosystems.



THE ENVIRONMENTAL BENEFITS ARE ONLY PART OF THE STORY; THE PROGRAM IS ALSO HELPING ADDRESS DISPARITIES IN LAND ACCESS AND CONSERVATION SUPPORT.

The environmental benefits are only part of the story; the program is also helping address disparities in land access and conservation support. The project includes partnerships with organizations like The KKAC Organization in Arkansas, which supports Black landowners and historically underserved rural communities. According to Executive Director Wilbur Peer, the work keeps families connected with generational land while also supporting projects that restore natural habitats.

"We're making sure people know that you don't have to sell your land to receive nearly the financial value of

the land by enrolling in the wetland easement program," says Peer. "So these farmers can pass this land along through generations – and when my 4-year-old grandson grows up, he'll be able to run around in the woods."

Seiss says the diverse benefits make the initiative extremely effective. The 33-year-old program may no longer be groundbreaking, but it's proven, practical and delivering results. "This is one of the most successful conservation programs ever," says Seiss. "We need to keep doing this. If you want something new and fresh, you can get that somewhere else. But keep us going."

What We Hope to Accomplish

Communities are facing big challenges because of climate change – and nature can be part of the solution. Nature can help address drought, flooding, declining ocean health and more. We work toward a landscape with these solutions:

