Uplift Report *2016*

The Freshwater Trust®

Changing the course of conservation

The Freshwater Trust is a group of problem solvers designing and implementing data-driven solutions that protect and restore America's freshwater.

THIS IS OUR RAISON D'ÊTRE. THE CENTER OF our work. For the past five years, The Freshwater Trust (TFT) has produced this report, marrying compelling stories with measurable outcomes.

What's included in the following pages is the result of diligent monitoring, the development of new systems for efficient data collection behind the scenes, countless cups of coffee with landowners and partners, and the deployment of tools and methods that ensure our work is strategic, effective, and results in what we call measurable "uplift."

WHAT IS UPLIFT?

"Uplift" was coined to describe the environmental outcome of a restoration action. Where traditional metrics for evaluating the success of a project focus largely on what was completed, calculating uplift takes it a step further.

Here's an example: rather than report only on the number of streamside trees planted, we also calculate how much sun will be blocked from reaching the water and increasing its temperature. Linking the planting of trees to improved stream temperature is only one way we connect the "what" of an action with the "how much" of an impact.

Quantifying outcomes in this way is unique in the world of conservation. But it is critically needed — especially now. The major problems facing western rivers — pollutants, nutrient runoff, low flows, a lack of streamside trees and more — are chronic and widespread.

We're proud to report that in 2016, we:

- kept **11,000 pounds of sediment** from impairing the quality of key waterways;
- increased function in **1,297 linear feet of stream**;
- planted trees that will block more than **282 million kilocalories of solar load** to help keep stream temperatures hospitable for native fish; and
- collaborated with 144 landowners to leave more than **68 million gallons of water per day** in key areas where fish need it the most.

That was in one year.

Measuring uplift is how we connect the "what" of an action with the "how much" of an impact.

As mission-driven practitioners supported by a host of individuals and entities, it's our responsibility to guarantee that what we're doing is making a quantifiable difference. And we are committed to sharing our results with the supporters who made it possible. That's how this report was born.

And because we've been quantifying our outcomes every year for five years, we have proof that things have improved dramatically.

Since 2012, we've increased stream function by 10,000 linear feet in the Sandy River basin. On one site along Little Butte Creek in the Rogue basin, we've blocked 13.8 million kilocalories of solar energy from impacting the river through the planting of native trees and shrubs.

These accomplishments, and the ones in the following pages, are born of the dedicated generosity and support of so many. Behind every number in here, there's a community of individuals who invested in our ability to make a difference.

We believe both our supporters and our rivers deserve the most significant return on investment possible. Thanks for trusting us to make that happen.

A YEAR OF RESULTS

Our projects implemented in 2016 achieved the following results:

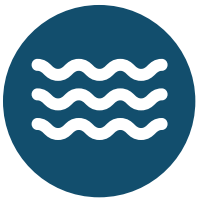
SOLAR LOAD AVOIDED

282,698,179
kilocalories per day

STREAM FUNCTION RESTORED

1,297
functional linear feet

FLOW RESTORED



106 cfs
or 68 million gallons per day across 7 basins

SEDIMENT REDUCED

11,051 pounds

NITROGEN REDUCED

129 pounds

PHOSPHORUS REDUCED

6 pounds

FIVE YEARS OF RESULTS

Cumulative uplift from projects implemented between 2012 and 2016:

Solar load avoided	Stream function restored	Flow restored	Sediment reduced	Nitrogen reduced	Phosphorus reduced
774,064,583 kcals/day	10,672 functional linear ft	between 64 – 106 cfs/year	477,708 lbs/year	1,717 lbs/year	211 lbs/year

It takes time to collect and analyze data on our projects. This report is meant to summarize our impact over the course of 2016. We will produce another report in the coming year, once we've closed out 2017.

HOW IS UPLIFT CALCULATED?

There are many tools to help understand how natural systems react to changing conditions. The following models are among those used to quantify the outcomes of our projects:

- **Nutrient Tracking Tool** to estimate the effects on nitrogen, phosphorus and sediment loads from actions such as installing fencing to exclude livestock from streams.

  Metric: Reduction in loading measured in pounds per year.

- **Shade-a-lator,** a module of the HeatSource model, to quantify the reduction in thermal loading from the sun to the river from actions such as planting streamside trees.

  Metric: Reduction in solar loading (or shade potential) measured in kilocalories per day. A kilocalorie is 1,000 calories; a calorie is the amount of energy required to heat 1 gram of water by 1°C.

- **Streamflow,** measured in cubic feet per second (cfs), is the volume of water that passes a given location within a given period of time. One cfs is equal to a volume of water one foot high and one foot wide, flowing a distance of one foot in one second — or more than seven gallons of water flowing each second.

- **Stream Function Assessment Methodology** to quantify the benefits to stream function from actions such as restoring side channels and placing large wood instream.

  Metric: Increase in stream function measured in functional linear feet — a combination of values for hydrologic, geomorphic, biologic and water quality functions.

- **Water Temperature Transaction Tool** to quantify temperature changes in a river reach from actions such as modifying irrigation practices to increase streamflow.

  Metric: Reduction in water temperature measured in degrees Celsius.

SANDY RIVER BASIN

A reach restored

WHILE OUR ORGANIZATION WAS FOUNDED on the banks of the Deschutes, some of our deepest restoration roots run through Oregon's Sandy River basin.

The 500-mile system stretches between the Mt. Hood National Forest and the Portland metro area. It encompasses the Bull Run watershed, which supplies Oregon's largest city with drinking water.

Timber harvests, removal of large instream wood to reduce flood risks, increased development, and road construction took such a toll on habitat that Sandy River salmon and steelhead were listed under the Endangered Species Act in 1998.

The threat was enough to prompt the formation of the Sandy River Basin Partners, a group of public and private organizations partnering to determine funding and strategic action. Together, The Freshwater Trust (TFT) and others determined the Salmon River and Still Creek to be two high-priority areas. More than 100 opportunities for improving habitat for migrating fish were identified.

Since 2006, we've installed nearly 300 large wood structures and reactivated 58,000 feet of historic side channel. And over the years, our staff has witnessed exactly how that's improved wild populations of once threatened species.

In 2016, the number of winter steelhead spawning in the upper Sandy basin had increased by more than 350% what it was when they were listed as threatened in 1998. Spring Chinook counts were also up, at 40 redds per mile. That's more than 200% the long-term average.

TFT and the Partners estimate that all restoration opportunities identified in 1999 will be complete by 2045.

SPOTLIGHT ON THE SALMON RIVER

The Salmon River winds through the Salmon-Huckleberry Wilderness, plunging over waterfalls in a narrow basalt canyon, and passing through eight miles of public and private lands before it meets the Sandy River. From headwaters to confluence, it has been dubbed "wild and scenic" by the federal government and attracts thousands of fishermen, paddlers, campers and hikers every year.

This classic Northwest beauty has many admirers. But it's not what it used to be. Following a major flood in 1964, sections of the Salmon River were straightened and diked. Side channels were disconnected and floodplain connections were reduced as a result. Furthermore, woody debris was removed for fear it would exacerbate flooding and damage downstream infrastructure.

"This is perhaps the most powerful testament to our ability to make a difference for a place."

MARK MCCOLLISTER

SANDY RIVER BASIN *including Salmon River and Still Creek*	
Total projects in basin *2006–2016*	15
Species benefited	Chinook salmon, coho salmon, steelhead trout, coastal cutthroat trout
Restoration actions	58,000 feet of side channel restored. 300 large wood structures installed
UPLIFT	
Stream function restored	**10,480 functional linear feet***

See definition of this metric on page 3.

"The Salmon had been scraped of its ability to support the fish that once thrived here," said Jeff Fisher, habitat monitoring coordinator. "Nearly a decade has been spent devising how to make it what it once was naturally."

Since 2006, 3.8 miles of the Salmon River main stem has been restored. Approximately 2.2 miles of side channel has been reconnected, and 65 large wood structures have been constructed.

During a 2016 snorkel survey of a 2.5 mile reach of the Salmon River, **80% of migrating spring Chinook were holding in enhanced pools where our large wood structures were installed.**

"The proof is in the presence," said Fisher. "We continue to see a positive and immediate response from fish."

MARK MCCOLLISTER
Habitat Restoration Director

If you want to learn about a creature, it's best to observe them in their natural habitat. This is often the case with people, too. To learn about Mark McCollister, you'd want to visit him when he's in the Sandy. McCollister is a "builder of fish homes" and a "river architect." Using a set of blueprints drawn from a deep knowledge of biology and many years spent exploring the area, McCollister guides local contractors on where to place the next log and where to begin planting trees along the next section of stream. Nearly every action The Freshwater Trust has taken in the Sandy basin has been at his direction.

SALMON RIVER: RIVER MILE 91 | *Large wood structures recruit gravel and create pools for fish spawning*

2013: Pre-project

2013: Post-implementation

2016

ROGUE RIVER BASIN

Shade produced. Nutrients reduced.

THE ROGUE LIVES UP TO ITS NAME, WILDLY carving its way from the Cascade Range to the Pacific Ocean. In 1968, it was dubbed one of the first eight "wild and scenic" rivers in the country.

Unfortunately, a national designation does not make it immune to issues common for a working river. Due to the straightening of stream channels, the removal of large wood, urban growth, and degraded streamside vegetation, habitat has decreased along both the river's main stem and its tributaries.

Partnering with the City of Medford, the Bureau of Reclamation and dozens of other local entities, The Freshwater Trust (TFT) has taken steps to improve the Rogue by planting streamside buffers and building large wood structures.

Over the last five years, nearly 90,000 native trees and shrubs have been installed. The shade produced by the plantings ensures the temperature is more hospitable for native fish and helping the City of Medford meet its temperature requirements under the Clean Water Act by offsetting the warm water discharged by the wastewater treatment facility. In addition to shade, the newly installed streamside buffers absorb more than 100,000 pounds of pollutants every year.

By working with private landowners and the Bureau of Reclamation, **we've also successfully installed 137 large wood structures in key places** we know fish will use them most.

"The Rogue is a perfect example of entities with different motivations coming together to improve a local resource," said Eugene Wier, restoration project manager.

LITTLE BUTTE CREEK: RIVER MILE 0.5 | *Five years of growth create a thriving streamside forest*

Pre-project

Year 1

Year 2

"The Rogue is a microcosm of our grand vision for strategic, collaborative restoration everywhere."

EUGENE WIER

ROGUE RIVER BASIN *including Little Butte and Bear Creeks and Applegate River*	
Total projects in basin *2012–2016*	17
Species benefited	Spring and fall Chinook salmon, winter and summer steelhead, coho salmon, Pacific lamprey
Restoration actions	25,109 feet of stream protected. 87,825 native trees and shrubs planted. 1,459 feet of side channel restored. 137 large wood structures installed
UPLIFT	
Solar load blocked	**437,921,017 kilocalories/day***
Phosphorus reduced	**51 pounds/year***
Nitrogen reduced	**594 pounds/year***
Sediment reduced	**107,949 pounds/year***
Stream function restored	**165 functional linear feet***

See definitions of these metrics on page 3.

SPOTLIGHT ON LITTLE BUTTE CREEK

Six of the 17 projects TFT has in the Rogue basin are along the 17-mile tributary of Little Butte Creek.

In 2011, TFT planted nearly three acres of streamside vegetation in Denman Wildlife Area, a 1,900-acre area of wetlands, grasslands and woodlands running along the creek. Five years ago, when placed in the ground, the willow, dogwood, ash and alder were barely a foot tall. Today, they've grown into a thriving forest. Twenty years from now, the site will be responsible for blocking 14 million kilocalories of solar energy from impacting the temperature of the creek.

To supply the plants for the project, TFT contracted with Plant Oregon, a local nursery in the rural town of Talent. According to owners Dan and Dave Bish, TFT is one of their biggest customers.

"Plants are not the only thing we're growing," said Wier. "We're supporting a budding restoration economy. Over the years, this work will touch dozens of local businesses and bring millions of dollars into the community."

EUGENE WIER

Restoration Project Manager

Eugene Wier calls the Rogue "fish Disneyland." Wier is The Freshwater Trust's Restoration Project Manager, a fisherman and part of the southern Oregon community. When he's not working alongside the river, he's waist deep in one, casting flies. Wier's decade of restoration experience helps him oversee both tree planting and large wood projects around the basin. Because his passion and first-hand knowledge of the river is infectious, he's also instrumental in recruiting others to help us make a difference.

Year 3

Year 4

Year 5

JOHN DAY BASIN

27 million gallons kept instream

THE JOHN DAY MOVES THROUGH THE UPPER desert of northeastern Oregon as one of the longest free-flowing rivers in the continental United States. Many of the basin's 500 miles of streams and rivers boast healthy populations of native fish, large blocks of public land, and community support.

Unfortunately, the basin's populations of spring Chinook, summer steelhead, bull trout, redband trout, westslope cutthroat trout and pacific lamprey often face low flows and high stream temperatures during summer.

Since 1995, The Freshwater Trust (TFT) has managed a flow leasing program that provides incentives for landowners to leave some of the water typically used for irrigation instream. Since 2012, at least 35 cubic feet per second (cfs) of streamflow has been added to stressed waterways throughout the John Day basin. **In 2016, 43 cfs (or 27,791,626 gallons per day) were left in the system and a record number of landowners participated in the program.**

In 2014, TFT also began supporting the efforts of the John Day Basin Partnership — a group of 30 organizations working on a coordinated, basin-wide, strategic plan. Our first step was an assessment of how flow conditions can be integrated with other water quality and habitat metrics to identify high priority restoration opportunities.

Over the next two years, TFT will continue to work with the Partnership to set science-based targets for the basin. With support from the Bonneville Power Administration, TFT will also work with landowners to increase flows and lower instream temperatures during summer months on several tributaries, including Reynolds, Rock, Beech and Standard Creeks. Additionally, we have begun integrating other watershed restoration techniques to further enhance our flow work. These include introducing large wood instream, realigning and restoring fish passage, and replanting native trees along the streambanks.

"The John Day is a great place to evaluate new ideas on how to improve flow and habitat," said Spencer Sawaske, hydrologist. "With a quantified approach, we hope to be a technical resource for all basin partners, improving the efficacy and efficiency of restoration work."

SPOTLIGHT ON REYNOLDS CREEK

Hot, dry summers and irrigation withdrawals have resulted in low flows and high water temperatures in Reynolds Creek, a tributary to the Upper John Day near Prairie City. The spring-fed system provides exceptionally

"This partnership is an example of how a group can collaborate and pursue the most pressing actions and the most ecologically valuable projects."

SPENCER SAWAKSE

JOHN DAY BASIN *including Upper, Lower, Middle Fork and North Fork*	
Total projects in basin	19
Species benefited	Summer steelhead trout, spring Chinook salmon
Conservation actions	Water leased from landowners to increase flow in streams during critical periods
UPLIFT	
Stream flow restored	**Between 35 and 43 cubic feet per second each year***

cool water to the river and refuge for over-summering adult spring Chinook salmon and federally threatened Mid-Columbia juvenile summer steelhead and bull trout.

Beginning in 2014, TFT partnered with two of the three water diverters on Reynolds Creek to restore flow to the system. Through a variety of voluntary water-use agreements, **substantially more water is now left instream to benefit fish than at any time in recent history.**

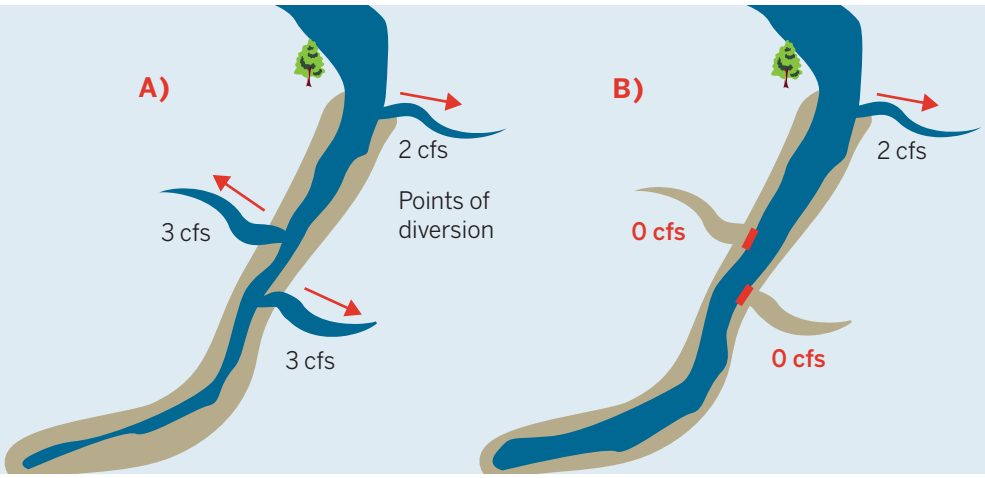
TFT operates three streamflow and temperature gages in the watershed to assess the impacts of the irrigation agreements. The data provide empirical evidence of reductions, due to instream flow increases from the water-use agreement. Mid-season irrigation shutoffs were modeled to have reduced water temperatures by 0.14°C in lower Reynolds Creek.

SPENCER SAWAKSE
Hydrologist

Spencer Sawaske doesn't waste words. He leans toward numbers, as in calculating the rate of flow in a river or checking water temperature gages. Some days, he is focused on a computer screen, managing hydrology data for multiple basins in Oregon. Other days, you'll find him east of the Cascades, knee-deep in a creek or talking to a landowner on a shady streambank. Wherever he finds himself, his calm demeanor and sharp focus help him unleash the knowledge needed to fix rivers.

*See definition of this metric on page 3.
This project was made possible through partnerships with Bonneville Power Administration, Columbia Basin Water Transactions Program, and Watercourse Engineering.

HOW A FLOW DEAL WORKS | *Keeping more water instream during low summer flows*



A) Water diverted for agriculture during the hot summer season reduces the amount of water left instream to support fish.

B) With negotiated flow deals, more water is kept instream when fish need it most.

MIDDLE SNAKE RIVER BASIN

A floodplain enhanced

THE SNAKE RIVER FLOWS INTO THE Columbia, the largest North American river entering the Pacific Ocean. At 1,078 miles, it works hard for the West. Used to generate hydropower since 1900, more than 500,000 customers rely on the Snake for electricity. Land along the river also supports vibrant agricultural communities. Barges on the river transport commodities to deep-water ports throughout the region.

Yet the natural function of this river is impaired. Flow and water velocities have decreased, streamside vegetation has been removed, and heat, sediment, and nutrient loads have increased over time. A consequence? The waters that historically supported an abundant population of native fish are compromised.

Beginning in 2014, The Freshwater Trust (TFT), River Design Group and other partners began collaborating with Idaho Power Company (IPC) to fix this. We completed a comprehensive evaluation of the watershed and built a process-based restoration plan for increasing river function for a more than 30-mile reach upstream of the Hells Canyon Complex.

The Snake River Stewardship Program encompasses three initiatives — narrowing and deepening key sections of the river channel, irrigation improvements to reduce the amount of nutrients and sediment entering the river, and planting native vegetation on the banks of tributaries to protect water temperatures.

To be able to relicense its dams, IPC will likely need to create more than 12 billion kilocalories per day through the restoration program. If the program moves forward over the next 40 years, TFT will quantify and track exactly how strategic restoration will more than offset the impacts of the dam.

In 2016, IPC broke ground on projects at Bayha and Wright Islands. Upstream in the Grand View area, projects in 2015 and 2016 converted 648 acres from furrow to sprinkler irrigation, preventing 1,000 pounds of sediment from washing off fields.

"We're attacking the factors that currently hinder the quality of this river from all sides," said Christy Meyer, Idaho conservation manager.

SPOTLIGHT ON BAYHA ISLAND

The Snake River Stewardship Program kicked off in 2016 with work on Bayha and Wright Islands.

Material was excavated from the river bottom and used to create floodplains adjacent to the islands. Excavation changed the channel depth from approximately two feet to between six and eight feet. Gravel and topsoil were also brought into the

"This project could end up being one of the largest restoration efforts of its kind in the country."

CHRISTY MEYER

new floodplains, and brush and small logs were added to create roughness. The floodplains were finished with sod mats and native vegetation, including willow, cottonwood, dogwood, currant and Wood's rose. In total, we built eight acres and planted 14,000 trees.

High water inundated the floodplains within two months of planting, but it produced minimal damage. Dozens of temperature loggers installed around the islands are tracking the change in water temperature as the area transforms from a slow-moving, shallow system to a fast-moving, narrower and deeper system.

How does expanding a floodplain and deepening a channel fix a river? Benefits include cooler, deeper water for fish; better filtration of sediment and nutrients; more areas of clean gravel for native fish reproduction; fewer unwanted aquatic plants; and enhanced wildlife habitat. **Information gained from this pioneering research project will inform the strategy for implementing additional instream projects throughout the Middle Snake River.**

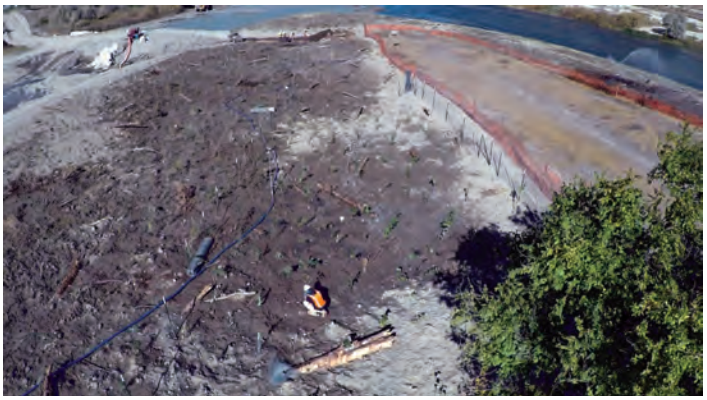
MIDDLE SNAKE BASIN *including the Marsing Reach*	
Total projects in basin	1 (Bayha Island Research Project)
Species benefited	Snake River Physa, white sturgeon, and mountain whitefish
Restoration actions	Increased island size by approximately eight acres and planted 14,545 native trees and shrubs
UPLIFT	
Solar load avoided	**211,800,000 kilocalories/day***

**Estimated value. See definition of this metric on page 3.*
Bayha Island is the first project site installed for this program. The uplift goal is 12 billion kcals/day.

CHRISTY MEYER
Idaho Conservation Manager

Christy Meyer loves a challenge, and conservation challenges don't come much bigger than the Snake River. Meyer, an ecologist by training, moved to Boise to open TFT's Idaho office after spending three years in the Portland office. In that time, she has strung temperature loggers, planted trees, piloted a motorboat, forged relationships with landowners of streamside property, and managed the multiple moving parts related to the Snake River Stewardship Program. The goal of having a positive impact on a river is what makes the challenge worthwhile.

MIDDLE SNAKE RIVER: RIVER MILE 439.5 | *Expanding a floodplain and deepening a channel to restore river function*



SACRAMENTO-SAN JOAQUIN RIVER BASIN

Quantified approach applied to California

THE FRESHWATER TRUST (TFT) HAS TAKEN what it has learned about quantified conservation in Oregon and Idaho and applied it to northern California.

The Sacramento-San Joaquin River Delta covers more than 1,100 square miles. It is one of the largest estuaries in North America, supporting more than 20 freshwater fish species and hundreds of other plants and animals, including spring, fall and winter Chinook salmon, Delta smelt, white and green sturgeon, riparian brush rabbits, Swainson's hawks, and white-tailed kites.

Once a vast freshwater marsh, the area was largely drained in the late 1800s under the Swamp and Overflowed Land Act, when levees were built and the exceptionally rich soil was converted for agriculture. Today, nearly 75% of the region is in agricultural production. The basin is also the nexus of a massive water delivery system, providing drinking water to the San Francisco Bay Area, as well as to coastal and southern California.

Long-term drought has spurred new state regulations requiring farmers and ranchers to sustainably manage and ultimately improve water quality and quantity. To comply with these programs, agricultural producers are being asked to make decisions that affect their land and the connected ecosystems. Three recent regulations with pressing requirements include the Irrigated Lands Regulatory Program (ILRP) to protect surface water quality, the Sustainable Groundwater Management Act (SGMA) to protect groundwater quantity and quality, and Senate Bill 88 (SB-88) for measuring and monitoring surface water diversions.

"While these new programs have the intention of fostering sustainable management of freshwater resources, they do not yet integrate with one another," said Erik Ringelberg, California director.

In May 2016, TFT opened an office in Sacramento. **Our team started building multiple programs in the basin focused on bringing together disparate sets of data from groundwater and surface water conservation actions.** To date, we are supporting 19 local agencies to collaboratively and more sustainably manage groundwater; working with nearly 100 farmers to help them fulfill reporting obligations to track surface water use; and designing "natural infrastructure" compliance solutions for regulated

"Our goal is to help achieve freshwater function in the region through an integrated water management approach that unites regulatory and conservation goals."

ERIK RINGELBERG

ANNA SWENSON
Community Outreach Coordinator

Anna Swenson's cell phone rings constantly. It rings when she is in TFT's Sacramento office, at her home in the Delta's Clarksburg community, and when she is taking her kids to soccer practice and church. On the line are Anna's neighbors, the many farmers and landowners of California's North Delta. For the past year, she has talked to hundreds of people about the region's surface water and groundwater resources and programs to help track and balance their use. Her upbeat personality and familiar face have persuaded many landowners to work with TFT to create a strong future for sustaining their rural agricultural community and its water resources.

municipalities. At the close of 2016, none of these programs was ready to move into the "on-the-ground" phase where we track uplift.

Over the next three years, we will be working with local experts and stakeholders to understand the links between a conservation action and changes to groundwater quantity and quality as well as surface water quantity and quality. Some actions may have positive benefits for one outcome and negative for another, which is why it's important that landowners have easily accessible information and are able to collaborate to meet regulatory objectives.

As projects move from planning to implementation, we will report back on the gallons of groundwater recharged, pounds of sediment and nutrient prevented from streams, nitrate hazard reduced, and surface water conserved.

NORTH DELTA | *Working with landowners to better monitor water*

The Freshwater Trust®

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