IDAHO CONSERVATION LEAGUE

DECLINING GROUNDWATER QUALITY IN THE EASTERN SNAKE PLAIN AQUIFER

Causes, Trends, and Public Health Effects

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EXECUTIVE SUMMARY

Groundwater quality in the Eastern Snake Plain Aquifer (ESPA) – southern Idaho's most important source of drinking water – is declining as a result of contamination by the overapplication of fertilizers and animal waste across the Snake River Plain. Although the ESPA supplies drinking water to over 300,000 Idahoans, it is particularly susceptible to contamination due to a host of geologic factors and pollutants from human activities. Of particular concern in this regard is the rapid growth of the industrialized dairy industry. The estimated 417,000 dairy cows in the Magic Valley (IDA, 2017) produce as much manure as a city of 12 million people, or nearly one-and-a-half times the population of New York City. The nitrogen and phosphorus input from fertilizer and animal waste far exceeds what typical crops can uptake, and the remainder is susceptible to entering the groundwater.

Based on a review of available data and literature, we draw the following conclusions regarding groundwater quality in the ESPA:

1. Nitrate contamination is a widespread and growing issue in the ESPA, with over two-thirds of sampled wells in the Magic Valley having measured concentrations above natural background levels, and in some areas, exceeding state/federal water quality standards.
2. Limited phosphorus data indicates that this type of contamination is also growing and has the potential to exacerbate existing problems in the Snake River.
3. Available data and modeling studies strongly indicate that nitrate and phosphorus concentrations will continue to increase in the coming decades.
4. These water quality issues will increasingly have more severe implications for Idaho's ability to meet water quality standards and protect the health of residents in the Snake River Plain.

A combination of stricter regulation of fertilizer and animal manure application by the appropriate state agencies along with industry-wide implementation of best-management practices (e.g., cover crops, residue management, no-till planting) is necessary to begin to address these groundwater issues.

INTRODUCTION

The Idaho Conservation League (ICL) is currently engaged in a multi-year campaign to make the Snake River swimmable and fishable again. For decades, water in the Snake River, its tributaries, and its aquifer has been polluted and overdrawn, resulting in poor water quality and declining flows. A river system that begins as a blue-ribbon trout stream in eastern Idaho and western Wyoming presently morphs into a polluted waterway that at times is unsafe to touch by the time it empties into Brownlee Reservoir near the Oregon border. The massive scale of the problem will require an equally extensive basin-wide restoration plan.

A key objective of ICL's Snake River campaign is to improve groundwater quality in the Eastern Snake Plain Aquifer (ESPA) – an integral piece of the Snake River system. Although the aquifer is often treated as "out of sight out of mind" by many, it supplies drinking water to over 300,000 Idahoans and helps support a large swath of irrigated agriculture in what would otherwise be a high desert. The purpose of this report is to provide an overview of the main threats to groundwater quality in the ESPA, examine trends in the available water quality data, and highlight public health concerns stemming from aquifer contamination – in short, to provide a snapshot of the current health of the aquifer.

The motivation for this report was the recognition that the overall health of the aquifer is declining. The sources and nature of pollution that is primarily affecting groundwater quality in the ESPA is well established (e.g., Frans et al., 2012; Skinner and Rupert, 2012; Rupert et al., 2014). Proliferation of irrigated agriculture and the rapid growth of the industrialized dairy industry have resulted in significant quantities of what are known as nutrients (primarily nitrogen and phosphorus) being introduced to the landscape, which have steadily infiltrated the groundwater and caused contamination problems. Most significant among these issues is nitrate contamination, which is already widespread in the ESPA and continues to increase in severity (Mahler and Keith, 2002; Skinner, 2017). The existence of formal Nitrate Priority Areas confirms that such problems exist (Mahler and Keith, 2002; Mahler et al., 2007). Degraded groundwater quality has been shown to lead to a host of health problems and presents a serious threat to one of the most important aquifers in Idaho.

Driftboat on the South Fork Snake / John Robison photo

EASTERN SNAKE PLAIN AQUIFER

GEOGRAPHY & GEOLOGY

The Eastern Snake Plain Aquifer (ESPA) covers approximately 10,800 square miles in southern Idaho, spanning from St. Anthony to Hagerman. The underground aquifer generally mimics the surface geology of the Snake River Plain, a broad ground depression formed by repeated volcanism in the last 12 million years. The northern boundary of the ESPA generally coincides with the southern terminus of the numerous mountain ranges in central and eastern Idaho, while the southern boundary closely mirrors the course of the Snake River and never deviates more than ten miles south of the river. The overall groundwater flow from northeast to southwest parallels a gentle regional elevation gradient in that direction. This flow pattern results in two main areas of discharge from the aquifer to the Snake River: a series of springs near American Falls and the Thousand Springs area near Hagerman (Link and Phoenix, 1996).

The unique geology of the Snake River Plain allows water to easily infiltrate the aquifer in voluminous quantities. Beneath the Snake River Plain, there is a very thick (~5,000 feet) stack of layered basalts formed during volcanism associated with the passage of the North American plate over the stationary Yellowstone hotspot. The basalt is highly fractured and surface water easily enters the aquifer through interconnected pore spaces characteristic to the rubbly lava flows. Most of the groundwater is present within the upper 300-500 feet of the aquifer, with a total storage capacity roughly equivalent to that of Lake Erie (200 to 300 million acre-feet) (IDEQ). The aquifer is naturally recharged by rain and snowpack runoff from Idaho's central and eastern mountains, and is currently supplemented by excess irrigation water and managed aquifer recharge.

IMPORTANCE

The ESPA is the largest aquifer in Idaho and one of the most productive supplies of drinking and irrigation water in the world in terms of quantity – a truly priceless resource. It is an Environmental Protection Agency-designated sole source aquifer that supplies drinking water to nearly 300,000 people in south-central and eastern Idaho, including the fast-growing I-86/84 corridor from Twin Falls to Rexburg. This aquifer enables land that would otherwise be high desert sagebrush to produce the bulk of Idaho's agricultural products and support extensive dairies and feedlots. In total, there are 2.1 million irrigated acres on the ESPA, about 60% of Idaho's total irrigated acres (IDWR, 2009). The generally high-quality, aquifer-fed springs along the Snake River support a robust aquaculture industry that earned the region the moniker "Trout Capital of the World." In total, it is estimated the ESPA region produces approximately 33% of all goods and services in Idaho, valued at $14.9 billion annually (IDWR, 2015).

CONTAMINATION ISSUES

Given the significance of the ESPA for both drinking water and other uses, it is imperative that Idahoans have access to clean groundwater. This section provides an overview of current contamination issues in the ESPA and how they affect groundwater quality.

SUSCEPTIBILITY TO CONTAMINATION

The ESPA is noted to be especially susceptible to contamination compared to other aquifers due to both geologic and human factors (Rupert et al., 2014):

1. *Geologic Characteristics.* The same characteristics that make the ESPA such a voluminous aquifer – well-drained soils and permeable volcanic rock – also make it susceptible to contamination. The high permeability of the aquifer, which stems from the fractured and porous nature of the basaltic rock, gives contaminants fast pathways into the groundwater system.

2. *Irrigation techniques.* Excess irrigation water applied to fields seeps into the groundwater, carrying nutrients and chemicals with it. That shallow groundwater is often withdrawn again and reapplied to the fields, which further concentrates nitrates and other dissolved constituents.

3. *Young Groundwater Age.* The average age of groundwater in the ESPA is only 15 years (Plummer et al., 2000). Young groundwater is more susceptible to contamination because most contaminants are associated with human activities that came into practice within the last 60 years.

4. *Oxic Conditions.* Groundwater in the ESPA typically displays oxic conditions, meaning it contains at least 0.5 mg/L dissolved oxygen (Rupert et al., 2014). In oxic conditions, nitrate is unlikely to break down into inert nitrogen gas and can therefore persist for decades in the groundwater system (Dubrovsky et al., 2012).

5. *Rapid growth of Idaho's dairy industry.* Over the past 30 years, Idaho has become the third largest milk-producing state in the country (Lauer et al., 2018). Since 1980, the number of dairy cows has nearly quadrupled, and the average farm size has more than doubled since 2007 to 1240 cows per farm (ISDA, 2017).

CONTAMINANTS OF CONCERN

The primary contaminants of concern affecting groundwater in the ESPA are nutrients such as nitrogen and phosphorus. These play an important role in growing plants, but in excessive quantities they can become harmful to human health and the environment. There are isolated areas of the ESPA with other forms of contamination, but the predominant aquifer-wide issues are linked to excess nutrients. The primary sources that affect the ESPA are fertilizers and animal waste. Fertilizer use for agricultural purposes on the Snake River Plain increased dramatically after 1950 and currently is responsible for roughly 160,000 tons of nitrogen input annually (Frans et al., 2012). Since 1980, the number of dairy cows in Idaho has increased substantially, from 148,000 head in 1980 to 614,000 head in 2019 (USDA, 2019). The majority of these dairy cows are located in the Magic Valley region, which overlies the ESPA.

Dairy farm in the Magic Valley / Ecoflight photo

In one year, a dairy cow generates manure that contains an average of 58 pounds of phosphorus and 336 pounds of total nitrogen (ASAE, 2005). For comparison, in one year, the average human produces excrement containing 1.3 pounds of phosphorus and 10 pounds of total nitrogen (Del Porto and Steinfeld, 1999). In other words, the average dairy cow produces over 33 times as much total nitrogen and 44 times more phosphorus than the average human in a given year. In terms of nitrogen input, the increase in dairy cows since 1980 is therefore equivalent to adding over 15 million people to the state in that timespan (current population of 1.79 million). The estimated 417,000 dairy cows in the Magic Valley (ISDA, 2017) produce manure resulting in a total annual nitrogen input equivalent to 14 million people.

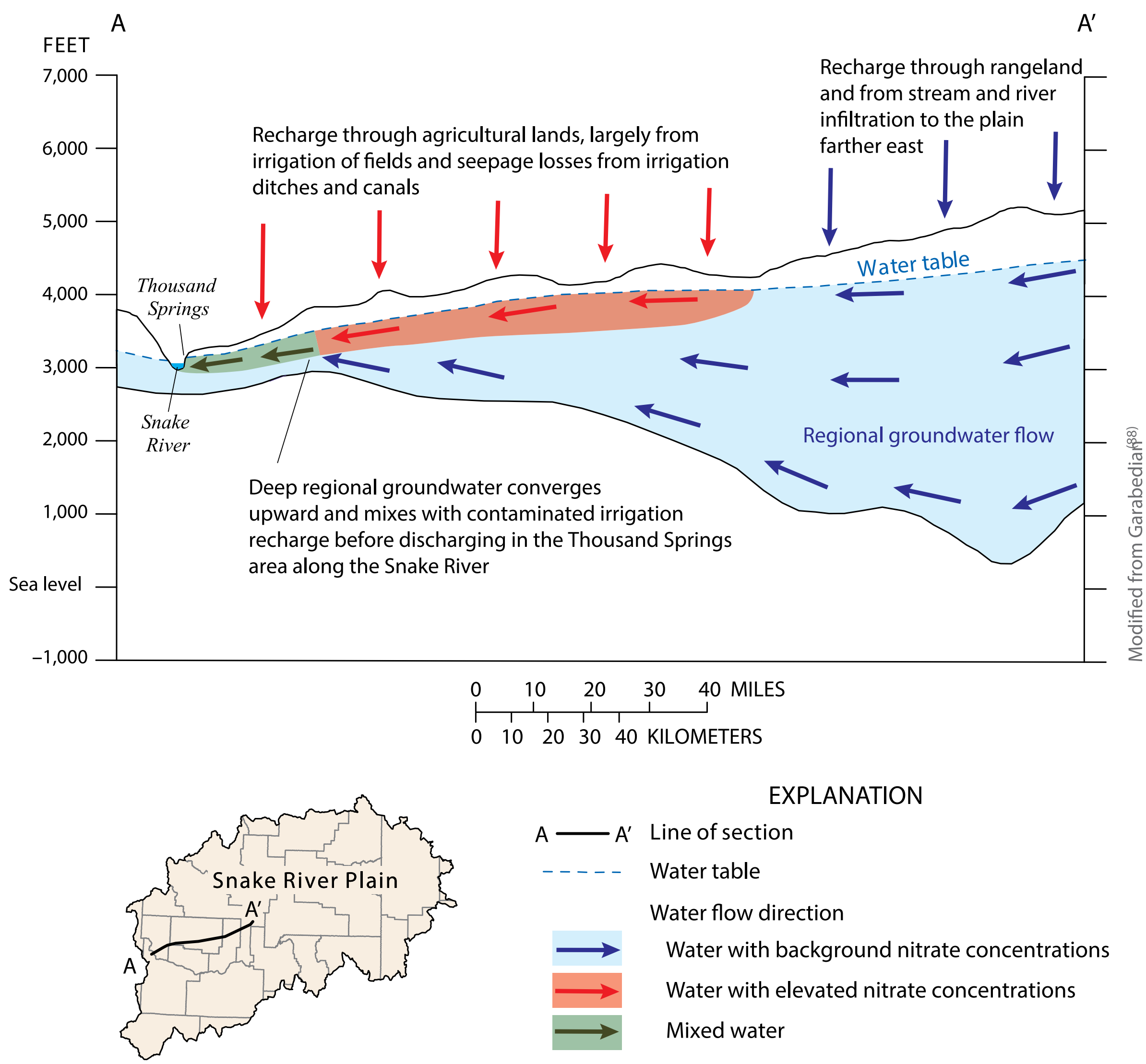
The combined nitrogen and phosphorus input from fertilizer and animal waste far exceeds what typical crops can uptake; thus, the excess is susceptible to entering the groundwater (e.g., Hirsh and Weil, 2019). The mobility of these elements in soil dictates how much they can enter surface and groundwater due to runoff or leaching. There is an important distinction between nitrogen and phosphorus soil mobility. Nitrogen, specifically in nitrate form (NO3-), is very mobile in soils and therefore leaches relatively easily into the water (Jury and Nielsen, 1989). Phosphorus, on the other hand, is largely retained in soils by a process called adsorption and does not leach easily into water (Sharpley et al., 1993; Sharpley, 1995). This difference in mobility helps explain why nitrate has been a more prevalent problem than phosphorus in the ESPA thus far. However, recent research has shown that once a soil's capacity to adsorb phosphorus is exceeded and becomes oversaturated, the excess phosphorus will freely leach into the subsurface (Domagalski and Johnson, 2012). There are indications from recent soil studies in the region (e.g., Lentz et al., 2018) that this process is already underway in portions of the Snake River Plain.

Agriculture and a dairy farm in the Snake River Plain / Ecoflight photo

GROUNDWATER FLOW DYNAMICS

To understand the pattern of groundwater contamination in the ESPA, it is necessary to understand the aquifer's groundwater flow dynamics. As shown in Figure 1, the aquifer geometry and thickness are such that regional groundwater flow is typically from northeast to southwest. The aquifer is recharged with generally high-quality, snowmelt-derived water, which eventually mixes with lower quality groundwater closer to the Snake River. This reduced-quality groundwater (indicated in pink on Figure 1) derives mainly from agricultural runoff that has high levels of nitrogen. North of the Snake River, mixing of the shallow, high-nitrate groundwater with the deeper, low-nitrate groundwater occurs as the aquifer thins with increasing proximity to the river (Rupert et al., 2014). Without this geometry-induced mixing forcing the higher quality groundwater to the surface, nitrate concentrations would be even higher than are currently observed in the ESPA (Skinner and Rupert, 2012).

Figure 1. Diagram from Rupert et al., 2014 (Figure 6-9, pg. 49 in that report) showing how groundwater flow patterns in the ESPA influence observed nitrate concentrations.



South of the Snake River, the aquifer is very thin and there is little to no upwelling of high-quality groundwater from deeper in the aquifer, as is often the case in the aquifer north of the Snake (Skinner and Rupert, 2012). Thus, these areas (which include the Twin Falls metro area) are particularly at risk from nitrate contamination because they do not have the benefit of dilution with deeper groundwater.

GROUNDWATER QUALITY

NITRATE

Most data regarding nitrate contamination in the ESPA comes from a series of USGS reports published since 2005. These studies are not comprehensive across the ESPA, but rather present datasets focused on specific areas, such as the Magic Valley. Most nitrate data from the Idaho Department of Environmental Quality (IDEQ) are from 2001 to 2010, with more recent nitrate data available only for wells in Lincoln County (see 'Data Needs' section).

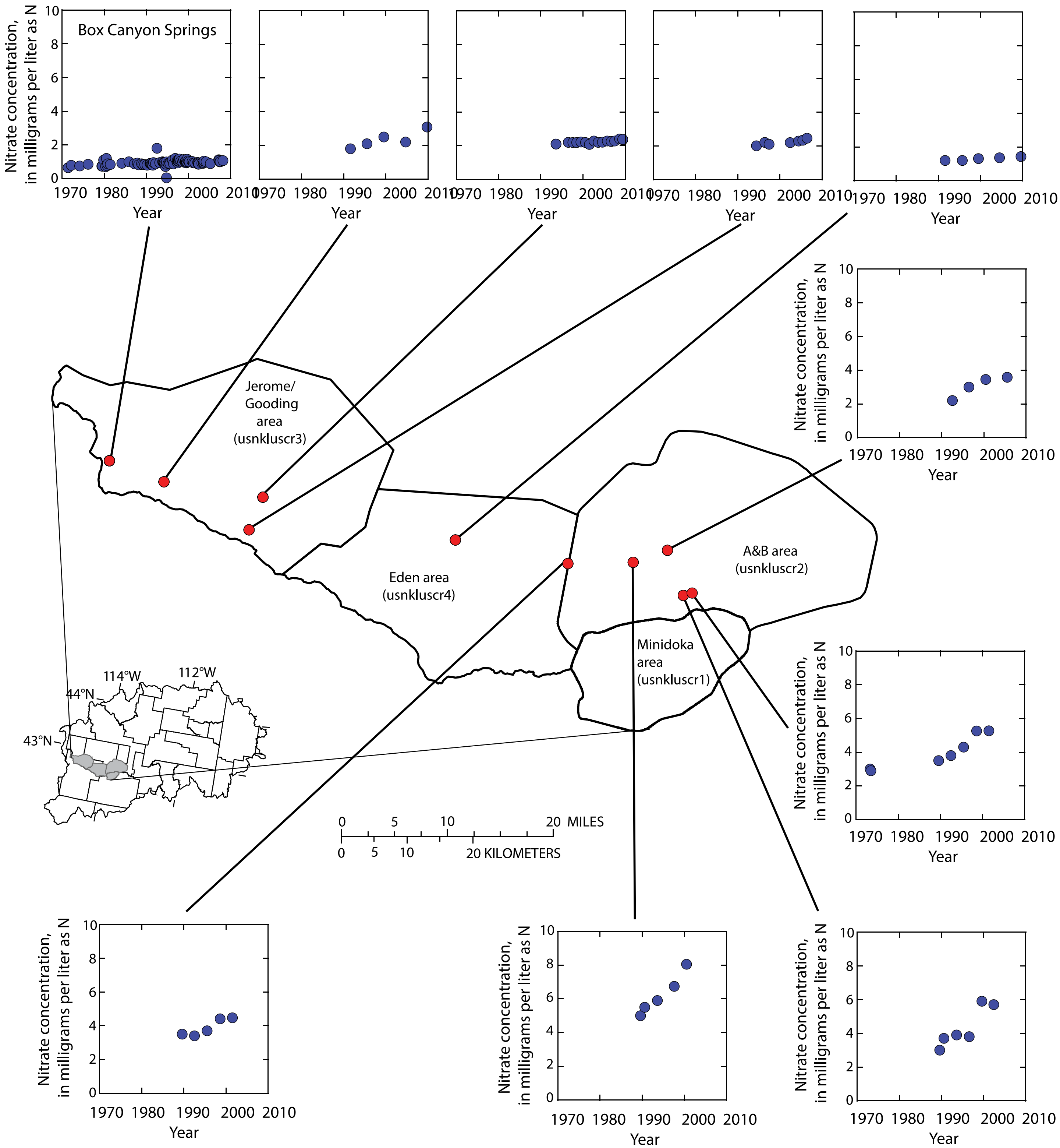
The available groundwater datasets clearly indicate that nitrate contamination is a widespread and growing issue in the ESPA. In our analysis of available IDEQ data for the Magic Valley (Gooding, Twin Falls, Lincoln, Minidoka, Jerome, and Cassia Counties), 69% of all well samples had measured NO3 concentrations greater than background levels (>2 mg/L). Low levels of nitrate are naturally occurring in groundwater, but concentrations above 2 mg/L indicate that human activities have put nitrate into the groundwater (Mahler and Keith, 2002). This same dataset also indicates that one-third of all samples had NO3 greater than 5 mg/L, which is starting to approach levels that are dangerous for human health.

In 2017, the U.S. Geologic Survey (USGS) published a report on groundwater quality in Jerome and Gooding Counties. In this report, groundwater samples were taken from 36 wells and analyzed for a number of constituents, including nitrate. Data showed generally increasing concentrations with increasing proximity to the Snake River (Figure 4 in Skinner, 2017), consistent with expected concentration patterns based on groundwater flow dynamics. NO3 values above 2 mg/L were widespread in southern Jerome County and southeastern Gooding County, with an isolated maximum of 9.93 mg/L (Skinner, 2017).

DEQ has identified 34 'nitrate priority areas' (NPAs) throughout the state during their last assessment in 2014. These are areas where at least 25% of wells sampled have nitrate concentrations of 5 mg/L or greater. Nine of the 34 NPAs in Idaho are located within the ESPA, including the top priority area (Marsh Creek NPA in the Burley, ID area). In the 2014 assessment, wells sampled within the Marsh Creek NPA were found to have an average NO3 concentration of 7.16 mg/L and a maximum concentration of 40 mg/L, with an increasing trend from previous assessments (IDEQ, 2014). 89% of samples from Marsh Creek were found to have nitrate concentrations above background levels (> 2 mg/L), with 23% of samples in excess of the human health standard of 10 mg/L (IDEQ, 2014).

A 2012 USGS study analyzed existing nitrate data from the ESPA and found that most wells with numerous samples collected over time showed increasing trends in nitrate concentration (Figure 2; Frans et al., 2012).

Figure 2. Figure from Frans et al., 2012 (Figure 21, pg. 38 in that report) showing nitrate concentrations over time at various sites in the Magic Valley.

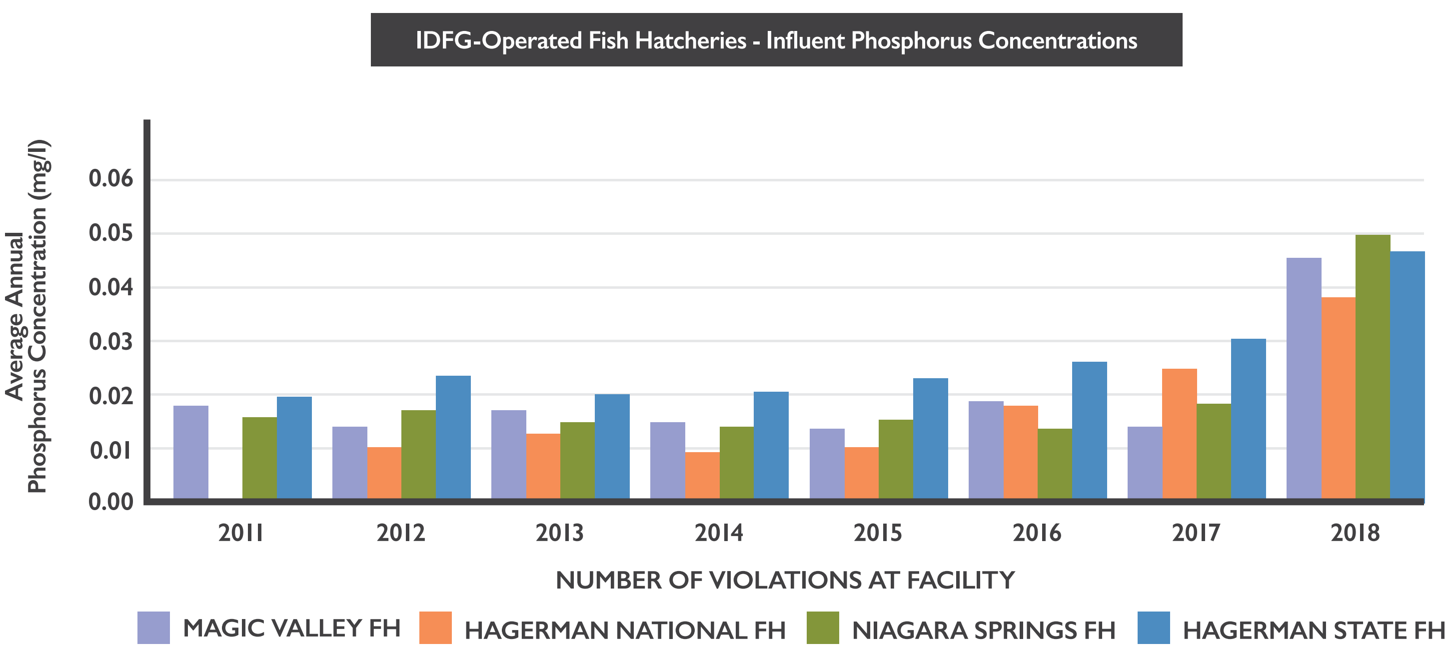


PHOSPHORUS

Publicly available phosphorus data for the ESPA is currently limited to datasets collected by the Idaho Fish and Game (IDFG) at the spring inflows at their hatcheries along the Snake River, as well as a small dataset from a 2017 USGS study. There are numerous aquaculture facilities along the Snake River that rely on spring water from the ESPA; these facilities have additional data pertaining to the quality of their incoming water, but this data is available only at the discretion of the aquaculture facilities. There are not publicly available phosphorus concentrations for IDEQ well samples analyzed for nitrate in the Magic Valley (see 'Data Needs' section).

IDFG has phosphorus data for the four facilities they operate along the Snake River, which rely on spring water from the ESPA – Hagerman State Fish Hatchery, Hagerman National Fish Hatchery, Niagara Springs Fish Hatchery, and Magic Valley Fish Hatchery. These springs have complicated plumbing systems; they are fed by groundwater from the ESPA but can be responsive to surface water flows as well. IDFG's phosphorus data demonstrate a noticeable increase in phosphorus concentrations since 2011 at all four facilities (Figure 3). For example, the average phosphorus concentrations at Hagerman have more than doubled over a 6-year period, when comparing the 2017-2018 period to the 2011-2016 period. The consistency of increasing concentrations at each of the four hatcheries is notable. The maximum single-sample influent phosphorus concentration measured was 0.072 mg/L at the Magic Valley Fish Hatchery in 2018. For reference, the not-to-exceed total phosphorus concentration for that section of the Snake River has been set at 0.075 mg/L in order to protect beneficial uses.

Figure 3. Graph showing increasing phosphorous concentrations in springs fed by the ESPA that flow into Idaho Fish and Game hatcheries along the Snake River. Data obtained from IDFG via public records request.



PROJECTED TRENDS

Several lines of evidence provide a compelling case that both nitrate and phosphorus concentrations will continue to increase for the foreseeable future in the ESPA:

1. **<u>The driving force behind existing elevated nitrate and phosphorus concentrations – livestock and agricultural activities – show no signs of slowing down.</u>** According to the 2017 Industry Profile published by Dairy West and the Idaho Dairymen's Association, the Magic Valley alone is home to nearly 417,000 dairy cows. Given that the average 1,400-lb dairy cow produces about 120 pounds of waste per day (LPELC, 2019), over 50 million pounds of dairy waste are created every day in the Magic Valley alone. Despite efforts to manage nitrogen and phosphorus on large dairy farms, this remains a staggering input to the lands above the aquifer. Agricultural fertilizer use also remains high across the Snake River Plain, accounting for at least 60,000 tons of nitrogen input every year (Skinner and Rupert, 2012). Both the number of dairy cows and amount of fertilizer use in the Snake River Plain are likely to increase, leading to correspondingly increasing nitrate concentrations (Rupert et al., 2014).
2. **<u>USGS numerical model simulations of nitrate in the ESPA indicate that it will take 40-50 years for concentrations to rise to the levels expected based on the amount of nitrogen that has been put on the land</u>** in recent decades (Skinner and Rupert, 2012). Thus, even if nitrogen input were held constant for the next several decades, concentrations would continue to increase for a significant amount of time before eventually leveling off (Skinner and Rupert, 2012). This same study also showed that if all agricultural nitrogen input was stopped immediately, nitrate concentrations would begin to decline in 5-10 years. This phenomenon highlights the notable lag time between land use activities and changes in groundwater quality (Rupert et al., 2014).
3. **<u>There is increasing evidence that continued phosphorus loading from animal waste and other sources has begun to saturate soils in the Magic Valley,</u>** which prevents phosphorus adsorption and leads to increased leaching of dissolved phosphorus into the groundwater (Lentz et al., 2018). Previous studies have shown that once phosphorus leaching zones develop, they can have long-term, negative effects on groundwater quality that take several decades to return to levels compliant with water quality standards (Schoumans and Groenendijk, 2000; Sharpley et al., 2013). Notable increases seen in the limited phosphorus data available are cause for concern that this process is underway in some portions of the ESPA, which could lead to increases in outbreaks of toxic algae, in aquifer-fed surface waters, reduced oxygenation of ground and surface water, and other environmental and public health concerns.
4. **<u>Sources of nonpoint source pollution to surface water (such as agricultural and manure fields) continue to have a large regulatory loophole in the Clean Water Act</u>** as they are not regulated with discharge permits and associated limits in the same manner as is point source pollution (e.g. from a wastewater treatment plant). Since groundwater quality is also not regulated by the Clean Water Act, if/when this polluted surface water enters the groundwater, the sources of that pollution will also not be regulated in this manner.

Based on the available information, it is likely that nitrate and phosphorus concentrations will continue to rise in the ESPA for the foreseeable future – even if all such inputs were stopped tomorrow. Due to the previously discussed complexities of the groundwater system, this increase in nutrient concentrations will vary significantly based on location. Based on numerical modeling simulations, a recent USGS report concluded that current hotspots of high concentrations will continue to increase in severity (e.g., southwest Minidoka County, northern Twin Falls and Cassia counties) (Skinner and Rupert, 2012). These hotspots are modeled to have average nitrate concentrations of 8-12 mg/L. Based on these figures, those hotspots would likely violate state and federal water quality standards designed to protect public health. Paradoxically, areas of high nutrient input, such as western Jerome County and southern Gooding County, will continue to have relatively low nitrate concentrations (<2 mg/L) because of consistent upwelling of low-nitrate groundwater in those areas (Skinner and Rupert, 2012).

IMPLICATIONS

FAILURE TO MEET WATER QUALITY STANDARDS

If current trends continue, it is increasingly likely that the federal/state nitrate drinking water standard of 10 mg/L – which is linked to human health concerns – will be violated in the vicinity of communities such as Twin Falls, Buhl, and Paul. Based on USGS numerical modeling, areas that are at higher risk of having water that violates human health standards include northern Twin Falls County, northwest Cassia County, and southwest Minidoka County (Skinner and Rupert, 2012). Because the spatial distribution of projected nitrate concentrations is primarily controlled by the flow patterns of the aquifer, the problems caused by high nitrogen inputs from large dairies and farms may show up in unexpected areas that seem not to be linked to those problems. Thus, there is some concern that the large farms and dairies in much of Jerome and Gooding counties, for example, can continue to input significant quantities of nitrogen into the system without seeing the consequences in the quality of the water that they use because the resulting contamination will show up down-gradient from them.

Idaho does not have a public health groundwater quality standard for phosphorus because it is not directly linked to human health effects in drinking water. However, the aquifer feeds numerous springs that discharge into the Snake River, which is listed as impaired for phosphorus for its entire length along the ESPA. Excessive levels of phosphorous in the river contribute to elevated levels of aquatic plant growth that reduce oxygen levels, leading to fish kills and reduced habitat quality. Excessive phosphorus also contributes to outbreaks of toxic algae, which poses a serious human health risk. To meet their narrative water quality standard to prevent excess nutrients, IDEQ has set a target to reduce current phosphorus levels to 0.075 mg/L in the mainstem Snake River between Milner Dam and King Hill. This target is not currently being achieved primarily due to nonpoint source pollution. If the springs that recharge the Snake River are also carrying significant phosphorus loads, it will exacerbate the nutrient-related problems on the mainstem Snake River and lead to continued violation of surface water quality standards in that reach. This will have serious and costly implications for existing point source dischargers on the middle Snake.

PUBLIC HEALTH ISSUES

Nitrate is a well-established cause of human health problems when it is found in drinking water above certain concentrations (Mahler et al., 2007). It is colorless, odorless, and tasteless in water and can only be detected by laboratory testing. The EPA has set the federal drinking water standard for nitrate at 10 mg/L, above which it is scientifically proven to cause potential health risks. The primary health risk associated with nitrate is blue-baby syndrome, which can affect infants younger than six months old. Bacteria in the digestive tracts of infants change nitrate into nitrite, which then enters the infant's bloodstream and reacts with hemoglobin (the molecule that carries oxygen in the bloodstream). This reaction produces a new compound called methemoglobin, which interferes with the blood's ability to carry oxygen. In the worst-case scenario, this process can result in decreasing oxygen levels leading to rare infant deaths (Mahler et al., 2007).

The long-term effects of drinking water with moderate to high levels of nitrate remains poorly understood (Mahler et al., 2007). However, studies have shown that long-term exposure to nitrate concentrations greater than 2 mg/L has possible links to bladder and ovarian cancer (Weyer et al., 2001) as well as non-Hodgkins lymphoma (Ward et al., 1996). More research is ongoing to determine a direct link between elevated nitrate concentrations and long-term health risks; however, at this time, the EPA does not include a carcinogenicity evaluation for nitrate (ATSDR, 2017).

The presence of phosphorus in groundwater is not known to have direct human health effects. However, phosphorus in the ESPA contributes to the overall rise of nutrient concentrations in the Snake River. The overabundance of phosphorus in the Snake River has contributed to the formation of harmful algal blooms, particularly in the numerous slow-moving reservoirs along the length of the river. Recent research demonstrates that phosphorus is the key driver of algal blooms in stagnant water environments like reservoirs and lakes (Higgins et al., 2017). In some circumstances, harmful algal blooms can produce toxins that cause a variety of illnesses in humans (Fleming et al., 2002). Outbreaks of harmful algal blooms on the Snake River and its reservoirs regularly result in closures of swimming areas and presents dangers to humans, animals, livestock and pets.

Nitrate and phosphorus pollution in the ESPA have yet to have noticeable, widespread effects to human health thus far. However, with the contamination problem expected to worsen in the coming decades and continued rapid population growth in the Snake River Plain, there is concern that human health impacts stemming from poor groundwater quality will surface and escalate. Delaying action would endanger more people and lead to a much more expensive problem to fix.

DATA NEEDS

As this report highlights, state and federal regulatory agencies need to obtain a better understand the scope and severity of the groundwater quality issues in the ESPA. The existing data is only sufficient to highlight a growing problem, not to fully characterize the issue. We identify the following data needs to be addressed by IDEQ (either by direct sampling or by obtaining existing data from others), ISDA, EPA, USGS, and other state and federal partners:

1. Creation of a widespread monitoring well network across the Magic Valley, with quarterly nitrate and phosphorus sampling and data compiled in a publicly accessible database. Well sites should be preferentially located in areas of known high nutrient contaminations based on

aquifer geometry and dynamics. Up-gradient well sampling should be incorporated as well to provide a natural background.

2. Monthly nitrate and phosphorus data collection from major springs entering the Snake River from the ESPA, compiled in a publicly accessible, user-friendly database.
3. Creation of a nutrient input inventory for concentrated animal feeding operations (CAFOs).

Obtaining and compiling this data is necessary to ensure state compliance with groundwater and surface water quality standards and safeguard public health. However, the need for better data should not serve as an excuse for inaction where it matters most – reducing the pollution that is causing the problem.

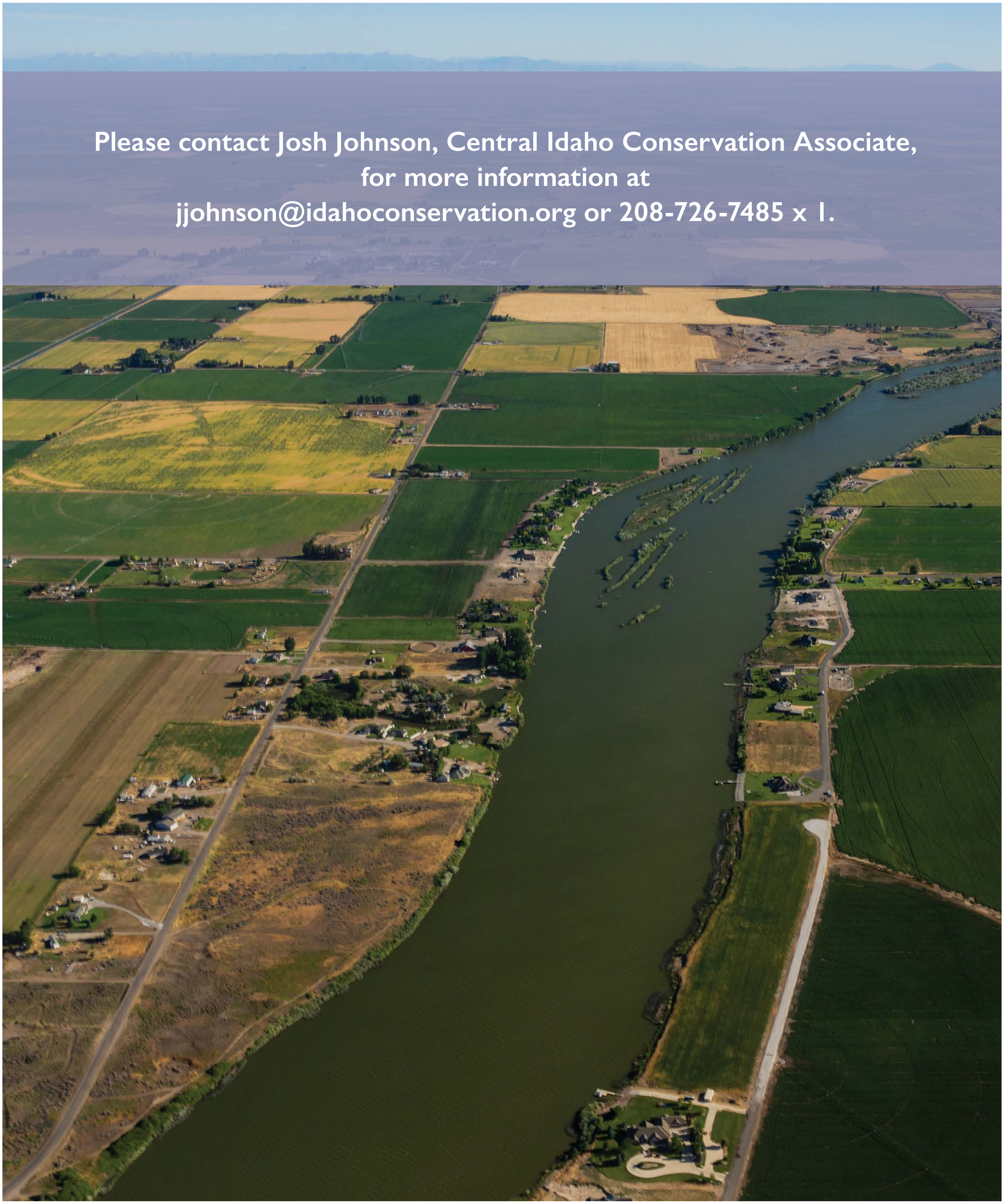
NEXT STEPS

Rising nitrate and phosphorus concentrations in the Eastern Snake Plain Aquifer are a growing problem that has serious implications for public health and the state's ability to meet its surface and groundwater quality standards. The available groundwater quality data, while limited, clearly indicates that nitrate and phosphorus concentrations are well above natural background levels in certain portions of the ESPA. These elevated concentrations are directly linked to human activities on the Snake River Plain – specifically, waste generated by large concentrated animal feeding operations and overapplication of fertilizer on agricultural fields. These concentrations are projected to continue to rise for the foreseeable future with likely worsening human health risks. To meaningfully address this growing problem, action is needed both by the state agencies that play a role in protecting the quality of Idaho's groundwater (IDEQ, IDWR, ISDA) and by the agricultural and dairy industries, whom are responsible for the lion's share of nitrogen and phosphorus inputs.

An important first action would be to centralize the state's responsibility of groundwater protection under a single regulatory agency. The current regulatory structure, as defined by the Idaho Ground Water Protection Interagency Cooperative Agreement, splits the responsibility of groundwater quality protection and sampling among five different state agencies – a highly disjointed and ineffectual approach that ultimately contributes to inaction. Consolidating this responsibility would improve the effectiveness, accountability, and transparency of the state in dealing with matters of groundwater protection – a significant step toward addressing groundwater quality issues in the ESPA and elsewhere across Idaho.

Timely actions are desperately needed to reduce the pollution problem itself. A combination of stricter regulation of fertilizer and manure application along with industry-wide implementation of best-management practices (e.g., cover crops, residue management, no-till planting) is necessary to begin to address these groundwater issues. In particular, we must find a solution to the 30 million pounds of dairy waste produced every day in the Magic Valley. Without changes to how manure is currently dealt with on the Snake River Plain, the nitrogen and phosphorus inputs to the groundwater will continue to increase and cause worsening contamination problems in the ESPA.

Simply maintaining the status quo is unacceptable if we want to protect the quality of our groundwater in the Eastern Snake Plain Aquifer. ICL will continue to work with the relevant stakeholders and state agencies to address this issue head-on.



Snake River / Ecoflight photo

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