Water Quality Monitoring in Story County, Iowa

2024 Annual Report

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Acknowledgements

Leadership

The following people participated in regular meetings in 2024 to provide direction and resources for local monitoring efforts, following a 10-year plan the group developed in 2020:

Story County: Sara Carmichael, Mike Cox, Laura Johnston

City of Ames: Dustin Albrecht, Liz Calhoun, Tracy Peterson, Mindy Bryngelson, Maureen Moroney

City of Gilbert: Tim Mattingly

City of Nevada: Ryan Hutton

Izaak Walton League: Heather Wilson (IWLA), Paul Readhead (Ames Chapter)

Prairie Rivers of Iowa: Dan Haug

The 10-year plan can be found at www.prrcd.org/story-county-water-monitoring or www.storycountyiowa.gov/1536/Water-Quality-Monitoring

Contact us

We appreciate the engagement of the public in this important work. Please contact Dan Haug at dhaug@prrcd.org Prairie Rivers of Iowa: 3116 S. Duff Avenue, Suite 201, Ames, Iowa 50010. 515-232-0048

Ioway Creek at Brookside Park in Ames, October, 2024.

Highlights from the 2024 Monitoring Season

This report shares findings from the fifth year of a locally-led effort to monitor water quality in streams and lakes across Story County, Iowa.

- **Participation in the volunteer program has levelled off, but more sites are being monitored regularly.**
  - 44 volunteers entered over 900 datasheets in the Clean Water Hub. 26 sites were monitored twice a month for the entire year. (See page 6)
- **Some pollutants are a bigger problem than others in Story County streams.**
  - Volunteers logged over 100 "poor" nitrate readings but 0 "poor" chloride readings in 2024. (See page 18)
  - Dissolved oxygen was consistently low at some sites, for reasons that are unclear and will need further investigation. (See page 23)
- **We are working on assessing and improving the accuracy of our data.**
  - There were large discrepancies between nitrate results from laboratory testing and volunteer testing that will need further investigation. (See page 14)
  - Biweekly transparency measurements from the volunteer program may be a more reliable indicator of sediment pollution than monthly lab tests. (See page 16)
  - None of our current methods can accurately measure sediment loads during major storm events (see page 29).
- **Most waters in Story County have high levels of fecal indicator bacteria.**
  - All thirteen streams with enough data to evaluate this season exceeded the primary contact recreation standard for *E. coli*. Three streams exceeded the secondary contact recreation standard. (See page 37)
  - One of two county swimming beaches met the standard.
- **Trends at a single site cannot be reliably used to evaluate conservation efforts**
  - Even if we look at five-year averages rather than yearly averages, nitrate trends in the South Skunk River are strongly influenced by rainfall (see page 16).
- **Comparisons between sites are more realistic way to evaluate conservation efforts.**
  - Keigley Branch has more cover crops in the watershed than Long Dick Creek. Nitrate concentrations over the past five years were lower, but phosphorus and sediment concentrations were higher. (See page 35)

Methods and locations

Water quality testing in the field by volunteers

Story County Conservation continued to equip staff and volunteers with kits to regularly monitor streams around the county.

- 44 volunteers participated (up from 38 the previous year)
- 53 sites were tested (down from 58 the previous year)
- 26 sites were visited at least 20 times (up from 20 sites the previous year)
- 902 data sheets were entered into the Clean Water Hub (down from 969 the previous year)

Staff and volunteers follow the protocols of the **Izaak Walton League** of America's Save Our Streams program[1] and enter data in the IWLA's online platform for volunteer monitoring—the Clean Water Hub[2]. Nitrate, pH, and chloride are measured with Hach test strips; orthophosphate and dissolved oxygen with Chemetrics ampoules; water clarity is measured with a transparency tube; and water temperature is measured with a thermometer.

The following pages show the locations of monitoring sites and how often they could be tested. Sites that were tested less than 12 times are excluded from most of the analysis. The map below also shows the location of sewage treatment plants relative to monitoring sites, as this can be a source of phosphate, nitrate, and chloride during dry conditions. In addition to the map in this report, an interactive map is available showing which sites are currently assigned to volunteers[3].

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[1] The Save Our Streams Volunteer Water Quality Monitor Manual can be found at:
https://iwla.org/save-our-streams/
[2] All sites monitored by Story County Conservation can be accessed on the Clean Water Hub at:
https://www.cleanwaterhub.org/organization/39
[3] https://arcg.is/1zKTzu
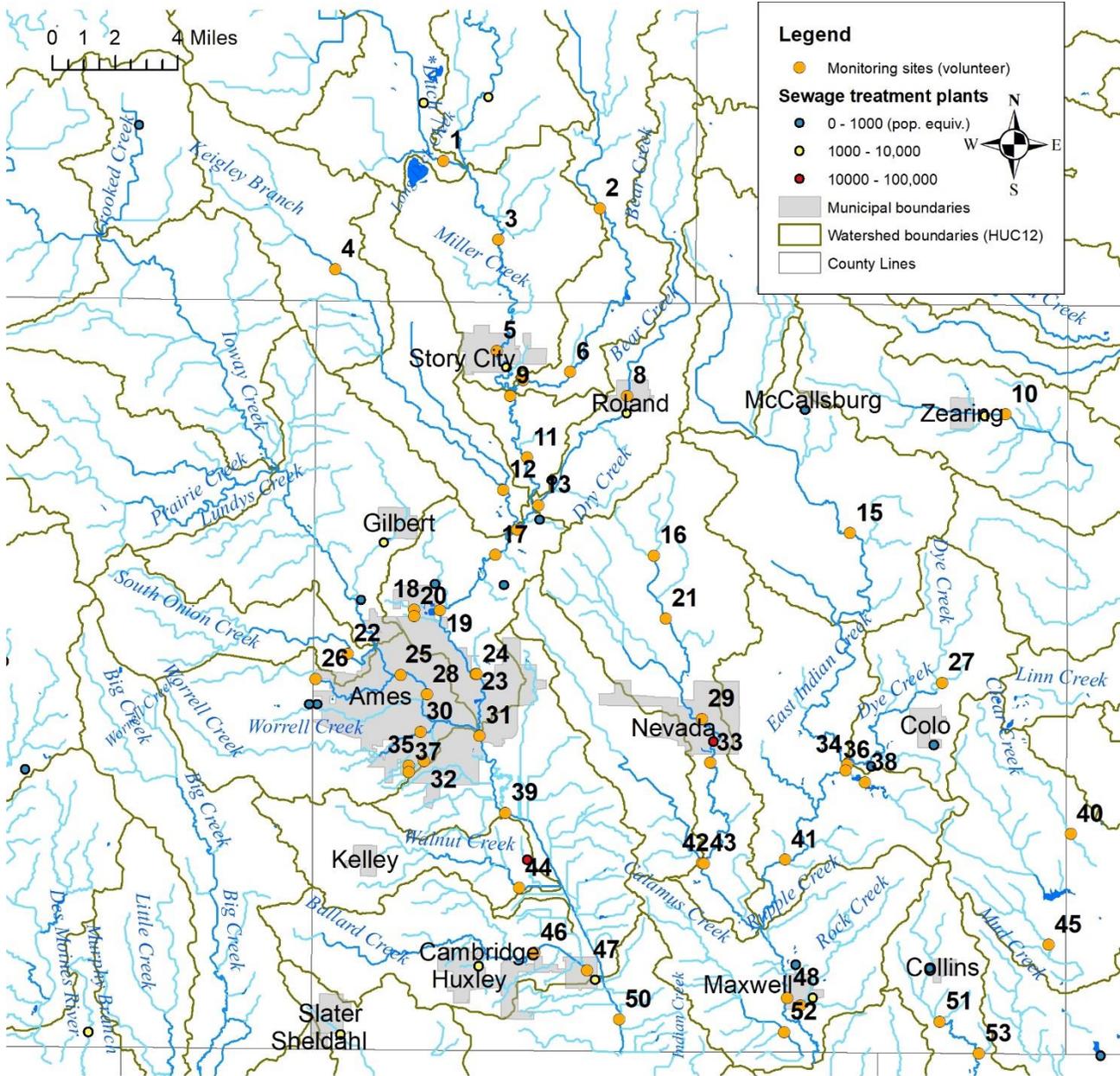
On map	ID in Hub	Site name	On map	ID in Hub	Site name	On map	ID in Hub	Site name
1	12583	Ditch 210 @ Saratoga Ave (Hamilton Co)	19	11515	S Skunk River @ W Riverside Rd (Ames)	37	11781	TELC S Inflow @ University Blvd (Ames)
2	12584	Long Dick Creek @ 370th St (Hamilton Co)	20	31057	Ada Hayden Lake SW Inflow	38	12535	Hickory Grove Park Lake
3	12585	S Skunk River @ 380th St (Hamilton Co)	21	10972	W Indian Creek @ 200th St	39	11577	S Skunk River @ 265th St
4	12586	Keigley Branch @ 390th St (Hamilton Co)	22	10977	Onion Creek @ 500th Ave	40	34713	Clear Creek @ 270th St
5	11578	S Skunk River @ Broad St (Story City)	23	11777	S Skunk River above dam (Ames)	41	10940	E Indian Creek @ 650th Ave
6	10931	Long Dick Creek @ 580th Ave	24	11870	S Skunk River below dam (Ames)	42	10195	Grant Creek @ 280th St
7	12183	Long Dick Creek @ 567th Ave	25	12182	Ioway Creek @ Stange Rd (Ames)	43	561	W Indian Creek @ 280th St
8	10932	Bear Creek @ W Maple St (Roland)	26	31059	Clear Creek @ Ontario St	44	11575	Walnut Creek @ 564th Ave
9	10723	S Skunk River @ Hwy E18	27	32005	Dye Creek @ 220th St	45	12203	Willow Creek @ 305th St
10	10970	M Minerva Creek @ 720th Ave	28	11975	Ioway Creek @ 6th St (Ames)	46	11598	Ballard Creek @ 570th Ave
11	10726	S Skunk River @ 150th St	29	10241	W Indian Creek @ Fairgrounds (Nevada)	47	10941	Ballard Creek @ 4th St (Cambridge)
12	10939	Keigley Branch @ 160th St	30	11823	Worrell Creek @ S 16th St (Ames)	48	10975	Indian Creek @ 2nd St (Maxwell)
13	10937	Bear Creek @ Pleasant Valley Rd	31	10981	S Skunk River @ S 16th St (Ames)	49	12025	Rock Creek @ South St (Maxwell)
14	10980	S Skunk River @ 170th St	32	11782	TELC Outflow @ S Riverside Rd (Ames)	50	12185	S Skunk River @ Hwy 210
15	11581	E Indian Creek @ 670th Ave	33	11573	W Indian Creek @ South S	51	31980	Wolf Creek @ 330th St
16	12207	W Indian Creek @ 180th St	34	10967	Dye Creek @ 670th Ave	52	12026	Calamus Creek @ 650th Ave (Maxwell)
17	10971	S Skunk River @ 180th St	35	11780	TELC N Inflow @ University Blvd (Ames)	53	34712	Wolf Creek @ 340th St
18	31058	Ada Hayden Lake NW Inflow	36	10942	E Indian Creek @ 250th St			

Timing of volunteer testing, 2024

Red number = number of completed data sheets

Story County Conservation recommended that sites be monitored on the first and third week of each month, and this year more volunteers were able to monitor their assigned site on this schedule. If a site could not be tested due to drought, thick ice, or a safety concern, volunteers were asked to submit a blank data sheet with a note about the conditions—153 of the 902 data sheets entered in the Clean Water Hub this year were for days when it was not possible to test water quality.

The main goal of the volunteer program is to educate and engage the public. The data will be useful for its wide geographic coverage, establishing a baseline for streams and lakes not previously monitored.

Snapshot Events

Having volunteers test multiple sites on the same day provides a "snapshot" of water quality across a broad area. The **Ioway Creek Watershed Coalition** has a tradition of twice a year water quality snapshots going back to 2006. After loss of state support for volunteer monitoring, **Prairie Rivers of Iowa** began coordinating the events in 2019.

- **May 21, 2024.** During a break in severe thunderstorms, we tested 33 sites in Story, Boone, and Hamilton Counties. We timed our event to match Polk County Conservation, the Panora Chapter of the Izaak Walton League, and the Committee to Save Bloody Run. Data from all 152 sites in 7 different counties can be viewed in this interactive map[4]. Due to heavy rains over the previous two days, many streams had muddy water and elevated nitrate and phosphate.
- **October 20, 2024.** Plans for a fall snapshot had to be cancelled because of drought. Instead, 6 volunteers surveyed benthic macroinvertebrates in Ioway Creek.

"Gilbert Creek" tested during spring snapshot, water was muddy but the golden alexanders were blooming.

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[4] Interactive map of results from spring snapshot: https://rpubs.com/dhaugprrcd/snapshot202405

Laboratory testing of water samples
This map shows surface water sites regularly sampled in 2024 and analyzed by a certified lab.
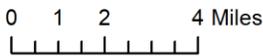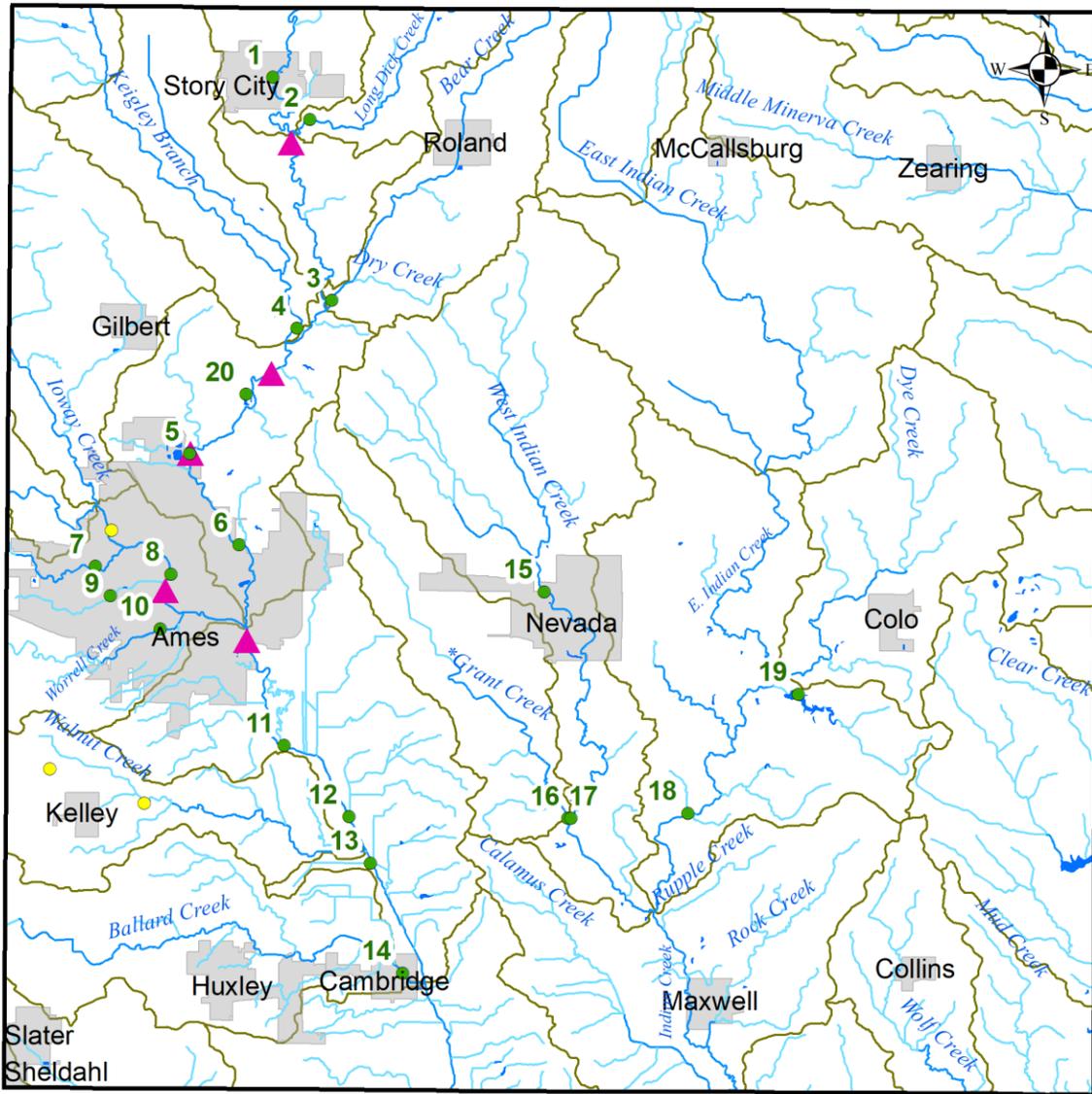
Legend

- ○ Real-time Nitrate Sensors (yellow)
- ● Monitoring Sites (Lab) (green)
- ▲ Gage (flow) (pink)
- ▢ Municipal boundaries (gray)
- ▢ Watershed boundaries (HUC12)
- Headwater streams
- Larger streams
- Lakes (NHD)

1	S Skunk River @ Broad St (Story City)	11	S Skunk River @ 265th St
2	Long Dick Creek @ 567th St	12	S Skunk River @ 280th St
3	Bear Creek @ Pleasant Valley Rd	13	S Skunk River @ 580th Ave
4	Keigley Branch @ 170th St	14	Ballard Creek @ 4th St (Cambridge)
5	S Skunk River @ W Riverside Rd (Ames)	15	W Indian Creek @ Lincoln Hwy (Nevada)
6	S Skunk River @ N River Valley Park (Ames)	16	W Indian Creek @ 280th St
7	Clear Creek @ Lee Park (Ames)	17	Grant Creek @ 280th St
8	Ioway Creek @ 6th St (Ames)	18	E Indian Creek @ 650th Ave
9	College Creek @ Sheldon Ave (Ames)	19	Hickory Grove Lake (swimming beach)
10	Worrell Creek @ S 16th St (Ames)	20	Peterson Park West Lake (swimming beach)

The City of Ames Water & Pollution Control (W&PC) Department operates a certified laboratory and does weekly testing of three sites on the South Skunk River. Samples are tested for nitrate, total phosphorus, suspended solids, and several other parameters, but not *E. coli. Because of the volume of data (weekly, going to back to January 2003) it is especially useful for understanding trends.*

- South Skunk River @ 265th St (0.3 miles above Water Pollution Control Facility)
- South Skunk River @ 280th St (0.3 miles below WPCF)
- South Skunk River @ 580th St (1.3 miles below WPCF)

To this, local partners have added 15 other stream sites. The Ames W&PC Department provided laboratory services to test these sites for nitrate, total phosphorus, suspended solids, and *E. coli* bacteria. Prairie Rivers of Iowa collected year-round monthly water samples from 10 rural streams and Pollution Control staff collected samples from another 5 sites within Ames.

Since samples are collected on the same day, this dataset is especially useful for making geographic comparisons that can help to prioritize conservation projects. Data from the South Skunk River at Sleepy Hollow Canoe Access (W Riverside Rd, north of Ames) will also be useful for evaluating trends, since this site was monitored by Iowa DNR from October 1999 to September 2014.

This chart shows the timing of sampling at the three weekly sites and 15 monthly sites that are the focus of our analysis (pages 28-38). The red number on the left is the number of samples. Reasons for missing samples include dry or stagnant conditions in smaller streams during the drought and thick ice cover during the winter. Other sites were monitored on a different schedule, but may be included in the E. coli analysis.

Lab sites: 2024 sampling dates
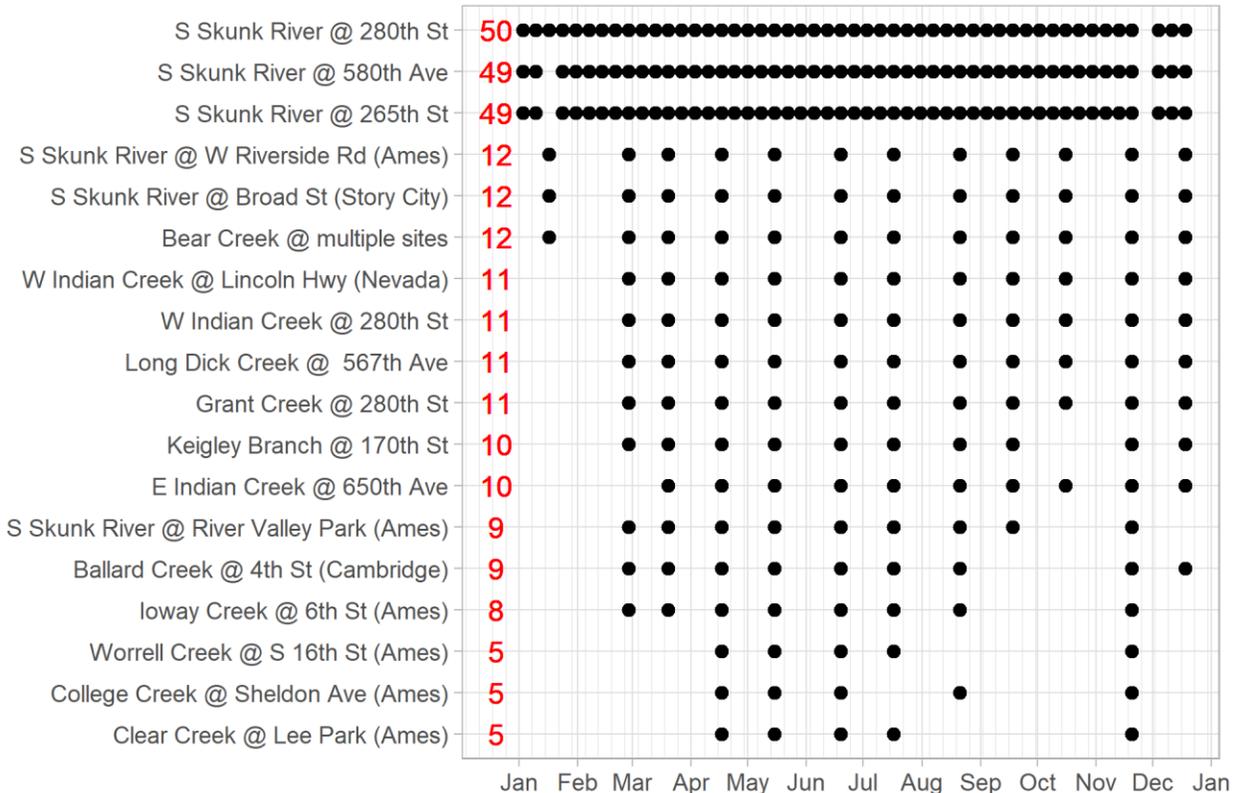
Story County Conservation continued to partner with Iowa DNR this year to test *E. coli* bacteria at two swimming beaches (West Peterson Park Lake and Hickory Grove Lake), on a weekly basis between Memorial Day and Labor Day. *This data is useful for informing swimmers of health hazards, or reassuring them if risk is minimal.[5]*

Hickory Grove Lake and Ada Hayden Lake are also sampled at their deepest point as part of the Ambient Lakes Monitoring program, a partnership between the Iowa DNR and the Iowa State University Limnology Laboratory. Each lake is sampled three times between May and September: once in early summer, once in mid-summer, and once in late summer/early fall. *This data is used to assess the ecological health of lakes*.

The Water Quality Research Lab (WQRL) at Iowa State University continued to support collaborative research at the Tedesco Environmental Learning Corridor through laboratory analysis of monthly water samples for nitrate and *E. coli*. (See page 37).

Although not included in this year's report, as part of the Ambient Stream Monitoring Network, the **Iowa Department of Natural Resources (IDNR)** continued monthly testing of:

- "South Skunk River near Cambridge." Site #10850002 in AQuIA. This site is just downstream of the outfall for the Ames Water Pollution Control Facility at 280th St. The City of Ames also tests this site, but on a different schedule and different parameters.
- "Indian Creek near Mingo". Site #10500001 in AquIA. This site is in Jasper County, but may be still be useful since we not have a site on Indian Creek below the confluence of the branches. It is located on N 51st Ave W in Jasper County, between Colfax and Mingo.

They are monitored monthly for 70 different parameters, including nutrients, *E. coli* bacteria, and pesticides. *Because of the variety of chemicals tested and the length of the record (going back to October of 1998), this data is especially useful for understanding which pollutants are a concern, seasonal patterns and trends, and for comparison to other sites across the state.*

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[5] During the summer, the most recent advisories and monitoring data for swimming beaches are posted here.
https://programs.iowadnr.gov/aquia/Programs/Beaches

Biological monitoring

Biological monitoring of streams usually involves capturing aquatic invertebrates with nets, sorting them into groups, and calculating a biological index based on the number of groups present and whether they are more or less sensitive to pollution.

The Izaak Walton League's Save Our Streams program involves identification of insects into broad groupings generally corresponding to taxonomic order. To submit biological data, at least one volunteer in the group must have completed a training a certification process. In 2024, volunteers surveyed benthic macroinvertebrates at two sites using Save Our Streams protocols:

- Worrell Creek @ S 16th St (Ames)
- Ioway Creek @ 6th St. (Ames)

The Iowa Department of Natural Resources uses a more rigorous invertebrate survey, typically narrowing down insects to the genus level. DNR also surveys fish in shallow streams using electroshocking to stun them. Fish are identified to the species level. The following sites were surveyed in 2024

- Ballard Creek near Cambridge Ballard Creek at Cambridge Recreation Learning Area
- Bear Creek at Skunk River Greenbelt
- Clear Creek at Ames
- South Skunk River at Osheim Prairie & Slough Preserve
- South Skunk River near Cambridge

Biological surveys complement water quality monitoring. If sensitive species are absent or diversity is low where suitable habitat exists, this is an indication of a problem with water quality.

Mayflies (left) are pollution sensitive. Damselflies (right) are somewhat pollution tolerant.

Quality Assurance

Several members of the planning team (Dan Haug, Sara Carmichael, Laura Johnson, and Maureen Moroney) are working on documenting and improving our procedures for a Quality Assurance Project Plan (QAPP) to be completed in 2025.

As part of this effort, we had an opportunity to compare laboratory and field methods at one of our sites in 2024 and found that while phosphorus results were close, test strips consistently underestimated nitrate concentrations. The discrepancies were especially large in November and December. We'll do more systematic comparisons in 2025 to see if accuracy can be improved with practice or with changes to our methods.

Long Dick Creek @ 567th St	**Lab** Nitrate-N (mg/L)	**Volunteer** Nitrate-N (mg/L)	**Lab** Total phosphorus (mg/L)	**Volunteer** Orthophosphate (mg/L)
3/20/2024	2	1	<0.1	0.1
6/19/2024	21	10	0.13	0.3
8/21/2024	7	5	<0.1	0.2
11/20/2024	12	2	<0.1	0
12/18/2024	14	2	<0.1	0
Average (these days only)	**11**	**4**	**0.1**	**0.1**

There are tradeoffs in water monitoring. Volunteers using test kits in the field can't measure as accurately as a certified laboratory, but they help us stretch our budget to cover more sites and test more often, which can reduce other sources of error. For some questions we have about water quality, an approximate answer is good enough. For others, a precise answer is needed and worth spending more time or money to get.

The South Skunk River at 265th St is tested weekly by a certified lab for nitrate (which normally doesn't change much from week to week) and total suspended solids (which can vary a lot from week to week). We can delete or round some of the entries in this high quality dataset to simulate the effects of testing less often, or with less precise equipment. This will help inform our QAPP. For example:

	Nitrate-N (mg/L)		Total suspended solids (mg/L)	
	2024 mean	2024 median	2024 mean	2024 median
Weekly lab tests	7.5 mg/L	6.8 mg/L	47 mg/L	15 mg/L
Monthly testing (first week)	7.2 mg/L	6.7 mg/L	22 mg/L	11 mg/L
Monthly testing (third week)	8.1 mg/L	7.0 mg/L	33 mg/L	16 mg/L

Based on this dataset, we can put the following sources of error in order of importance.

Frequency of testing, with large outliers: There were two days in May of 2024 when TSS reached 420 mg/L after heavy rains. If you had sampled biweekly on just the even weeks, you would have missed them, and underestimated mean TSS by 41%. If you had sampled biweekly on the odd weeks, these outliers would have been over-represented in the dataset, causing you to over-estimate TSS by 44%. Sampling monthly, errors could be as high as 53%.   Median TSS is less sensitive to outliers (errors less than 10% for biweekly sampling, less than 30% for monthly sampling), but answers a different question. The median represents middle-of-the-road conditions affecting aquatic life, while the mean is a better measure of how much pollution is sent downstream.

Data entry errors: A missed decimal place during data entry could have similar effects to outliers, if not caught and fixed. We now have some R code to identify data outside the normal range of our equipment so the team can follow up and make corrections more quickly.

Seasonal gaps: Nitrate, temperature and dissolved oxygen have strong seasonal patterns. Many of our sites have seasonal gaps because of drought, ice, road closures, or because the person assigned to monitor a site was unavailable. A few months of missing nitrate data can introduce errors of 10-30%, for both mean and median. TSS does not have a strong seasonal pattern, but had the same level of error due to outliers (which may be omitted or over-represented in a dataset with seasonal gaps). Nitrate in Worrell Creek was consistently lower than the South Skunk River in months when the creek was flowing, but because was dry for much the year, the annual average is higher.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Avg.
SSR	1	3	1	10	22	17	15	6	1	1	9	10	**8**
WC				6	18	12	11				7		**11**

Low precision equipment: While laboratory methods might be able to measure nitrate to the nearest 0.1 mg/L and pH to the nearest 0.1 unit, nitrate test strips are matched to the nearest of six color (0, 1, 2, 5, 10, 20, and 50 mg/L). Test strips for pH strips also have six intervals. This is close enough for some purposes but not for others. Rounding laboratory nitrate data to match the intervals of the test strips introduced small errors in the mean (4%) but large errors in the median (26%).

Detection limits: Chloride titrators are more precise than nitrate test strips, with 32 possible intervals, but are meant for results between 30 and 600 mg/L. Half of our chloride measurements are somewhere between 0 m/L and the 30 mg/L detection limit. The methods employed by the laboratory also have detection limits: 1 mg/L for nitrate, 2.5 mg/L for TSS, 0.1 mg/L for total phosphorus, and 10 MPN/100mL for E. coli. We simulated a detection limit affecting 40% of our data by changing all the nitrate readings below 5 mg/L to either zero, the detection limit (5 mg/L), or half the detection limit (2.5 mg/L). These substitutions introduced errors of 5-20% to the mean. Medians are unaffected by detection limits, unless more than half the data at a given site is below the detection limit.

Frequency of testing, without large outliers: By chance, a set of 12 or 24 monthly samples might be cleaner or dirtier than we would find if we had tested every day. This is less of a problem when there are no large outliers. Simulated biweekly nitrate sampling had errors of less than 3% and simulated monthly sampling had errors of less than 15%.

Long-term water quality trends

We now have five years of data from our 15 monthly lab sites, and 3-4 years of data from many of our volunteer sites. This allows us to make comparisons between sites across a range of conditions. For example, we can see a large difference in nitrate concentrations between these three (lab) sites. The ranking is consistent across years, but the gap is much more noticeable in the wettest year, 2024, or when we focus on wetter conditions. See page 35 for more details.

Year	Rainfall (inches) at Ames airport	Average nitrate-N (mg/L)		
		College Creek	Keigley Branch	Long Dick Creek
2020	23	3	6	7
2021	30	3	6	6
2022	37	2	6	7
2023	32	3	6	7
2024	39	4	9	12
Wetter conditions (all years) 90-600 cfs at nearest gage		4	12	16

We also have over 20 years of weekly nitrate data from three sites on the South Skunk River. This graph shows the site just upstream of the Ames Water Pollution Control Facility at 265th St. While nitrate concentrations in 2024 were the highest we have observed in five years, they are lower than observed from 2003-2007 or 2013-2016.
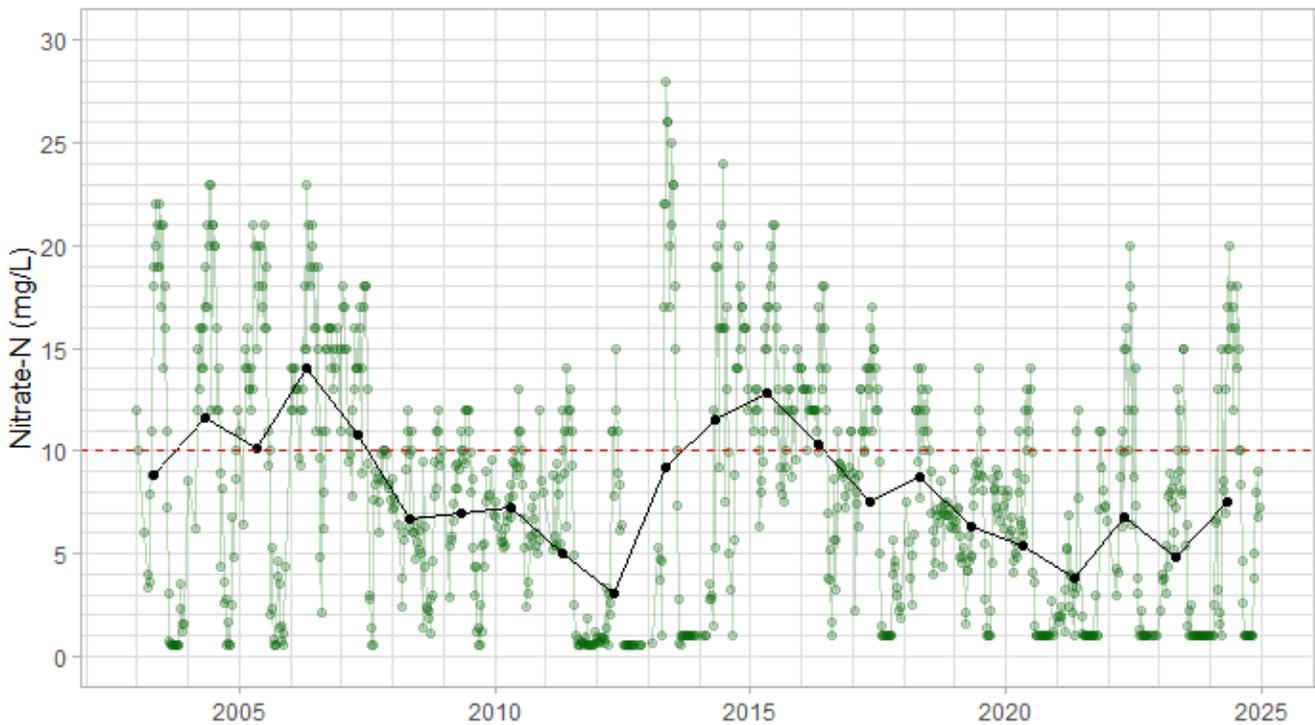
Unfortunately, the downward trend in nitrate over the past decade cannot be taken as a sign that our conservation efforts are succeeding. Similar patterns can be observed in control plots from ISU research farms, which have had no change in land management.

Nitrate loss from plots with cover crop (brown) and no cover crop (teal) at ISU's Allee Demonstration Farm[6].
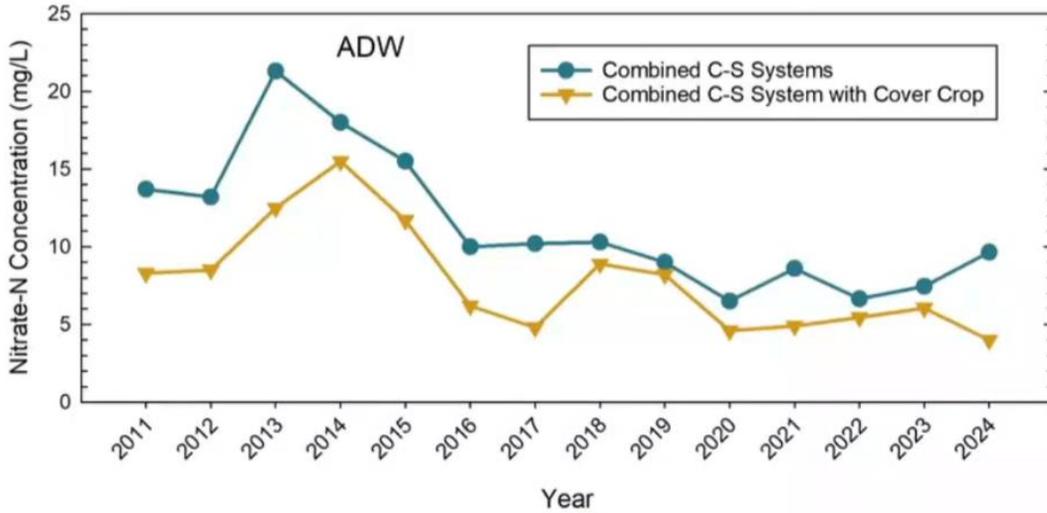
The problem of weather driving nitrate trends persists even when we have more data and can look at a multi-year average. The table below was created using 20 years of weekly nitrate data from the South Skunk River at 265th St and daily flow data from the nearest gage (adjusted for watershed area). Linear interpolation was used to estimate nitrate concentrations on days with no water sample. Average nitrate concentrations and loads in the past five years are lower than the previous five, but that's probably because those five years are drier.

Year	Average flow at nearest gage (cfs)	Median nitrate concentration (mg/L)	Mean nitrate concentration (mg/L)	Flow-weighted mean nitrate concentration (mg/L)	Nitrate yield (lbs/acre)
2006-2010	326	9.3	9.6	10.2	144
2011-2015	171	4.7	7.2	14.0	52
2015-2019	373	8.8	9.0	10.0	101
2020-2024	143	4.0	5.6	10.5	41

Nitrate does appear to be lower in 2020-2024 than in 2011-2015, which had similar rainfall. Comparing wet periods to wet periods and dry periods to dry periods can help to account for some, but not all, of the influence of weather on water quality to get other factors[7]. Analyzing trends from a single site is not a reliable way to evaluate the progress of conservation efforts.

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[6] Figure from 2024-09-11 Iowa Learning Farms webinar by Matt Helmers.
https://vimeo.com/showcase/10108315/video/1008540701
[7] Two of my attempts to analyze nitrate trends, controlling for streamflow and/or antecedent moisture.
https://www.prrcd.org/peel-onion/
https://www.prrcd.org/the-water-monitoring-is-deep/

Volunteer Testing of Water Chemistry, 2024

The Save Our Streams program helps volunteers interpret their data with a good/fair/poor categorization scheme, and with color coding on the Clean Water Hub.

	Excellent	Good	Fair	Poor
Dissolved Oxygen (% saturation)	80 - 120	70 - 79 120 - 140	50 - 69	< 50
pH (units)	7.0 – 7.5	6.5 - 6.9 7.6 - 8.5	5.5 – 6.4 8.6 – 9.0	< 5.5 > 9.0
Chloride (mg/L)	0 – 30	30- 50	51 - 250	> 250
Reactive Phosphate (mg/L)	0 – 0.2	0.3 – 0.5	0.6 – 2.0	>2.0
Nitrate (mg/L)	0 - 3	> 3 - 5	> 5 - 10	> 10
Transparency (cm)	>= 60	60 – 35.0	34.9 – 15.5	< 15.5

Some of our transparency tubes only have markings up to 60 cm and most chloride kits have a lower detection limit of 28-32 mg/L, so I changed the thresholds for "excellent" to match our detection limits, but otherwise I use the same categories and colors for the graphs on the next few pages, which show the median (black square) or mean (black triangle) and range (black line). For example, this site normally averages 85% dissolved oxygen (excellent), but we've seen as high as 140% (good) which is an indication of too much algae, and as low as 35% (poor) which could kill off mayflies and other sensitive animals in the stream.

Example graph: range and median

Indian Creek @ 2nd St Maxwell

Dissolved oxygen saturation (%)
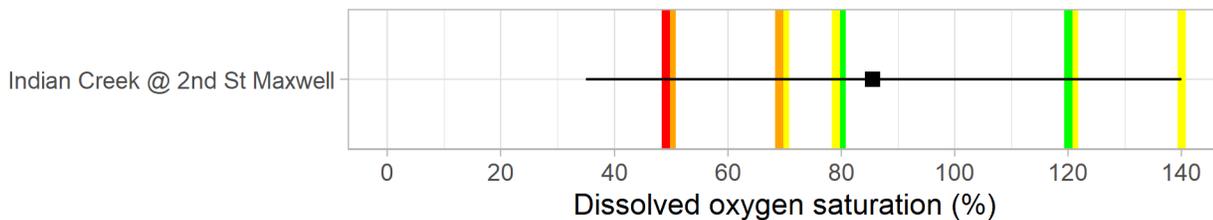
The majority of the data collected in 2024 would have been coded as "good" or "excellent." Of the data coded as "poor", the most common issues were high nitrate, followed by low dissolved oxygen and low transparency. We did not observe any "poor" chloride readings this year (earlier presentations reported one, but it turned out to be a data entry mistake).

274 "Poor" readings (6%) in 2024

110 x Nitrate	> 10 mg/L
66 x Dissolved Oxygen	< 50%
56 x Transparency	< 15.5 cm
35 x Phosphate	> 2.0 mg/L
6 x pH units	< 5.5 or > 9
0 x Chloride	> 250 mg/L

Most of the analysis below focuses on 36 sites that were tested at least 12 times in 2024. This cutoff was set so as not to exclude streams that were monitored twice a month but that were frozen in January and dried up during the fall. The other 17 sites were monitored less often, so averages for the year may not be representative.   You can still view the data for these sites on the Clean Water Hub, and below I've tallied "poor" readings that could indicate a problem. Both branches of the creek at the Tedesco Environmental Learning Corridor (TELC) had consistently low dissolved oxygen when they were tested in the fall. We collected monthly grab samples for the lab at the sites marked in red, but have limited volunteer data.

Site ID	Site name	Times tested	Number of "poor" samples						
			DO	pH	Chloride	Phosphate	Nitrate	Transp.	Total
11781	TELC south inlet @ University Blvd.	7	6	1	0	0	0	2	9
11780	TELC north inlet @ University Blvd.	10	6	0	0	0	0	0	6
10940	East Indian Creek @ S27	11	2	0	0	2	2	0	6
12207	West Indian Creek @ 180th St	8	1	0	0	2	2	0	5
10980	South Skunk River @ Soper's Mill	8	0	0	0	0	3	2	5
11515	South Skunk River @ W. Riverside Rd	9	0	0	0	0	4	1	5
32005	Dye Creek @ 220th St	7	1	0	0	0	2	1	4
12203	Willow Creek @ 305 ST	8	0	0	0	0	4	0	4
31980	Wolf Creek @ 330th St	9	0	0	0	0	3	1	4
561	West Indian Creek @280th St	3	0	0	0	2	0	0	2
10970	Middle Minerva Creek @ 720th Ave.	1	1	0	0	0	0	0	1
10931	Long Dick Creek at 580th Ave.	1	0	0	0	0	0	0	0
12535	Hickory Grove Park Lake	1	0	0	0	0	0	0	0
10195	Grant Creek @280th St	3	0	0	0	0	0	0	0
10932	Bear Creek at West Maple St. (Roland)	7	0	0	0	0	0	0	0
10981	South Skunk River @ S. 16th St.	7	0	0	0	0	0	0	0
31057	Ada Hayden Lake SW Inflow	8	0	0	0	0	0	0	0

Nitrate

Average nitrate concentrations ranged from less than 5 mg/L at the Tedesco Environmental Learning Corridor (TELC), Onion Creek, and Ioway Creek to more than 10 mg/L at Ballard Creek and Walnut Creek.

Volunteer nitrate results: range and mean
At least 12 samples
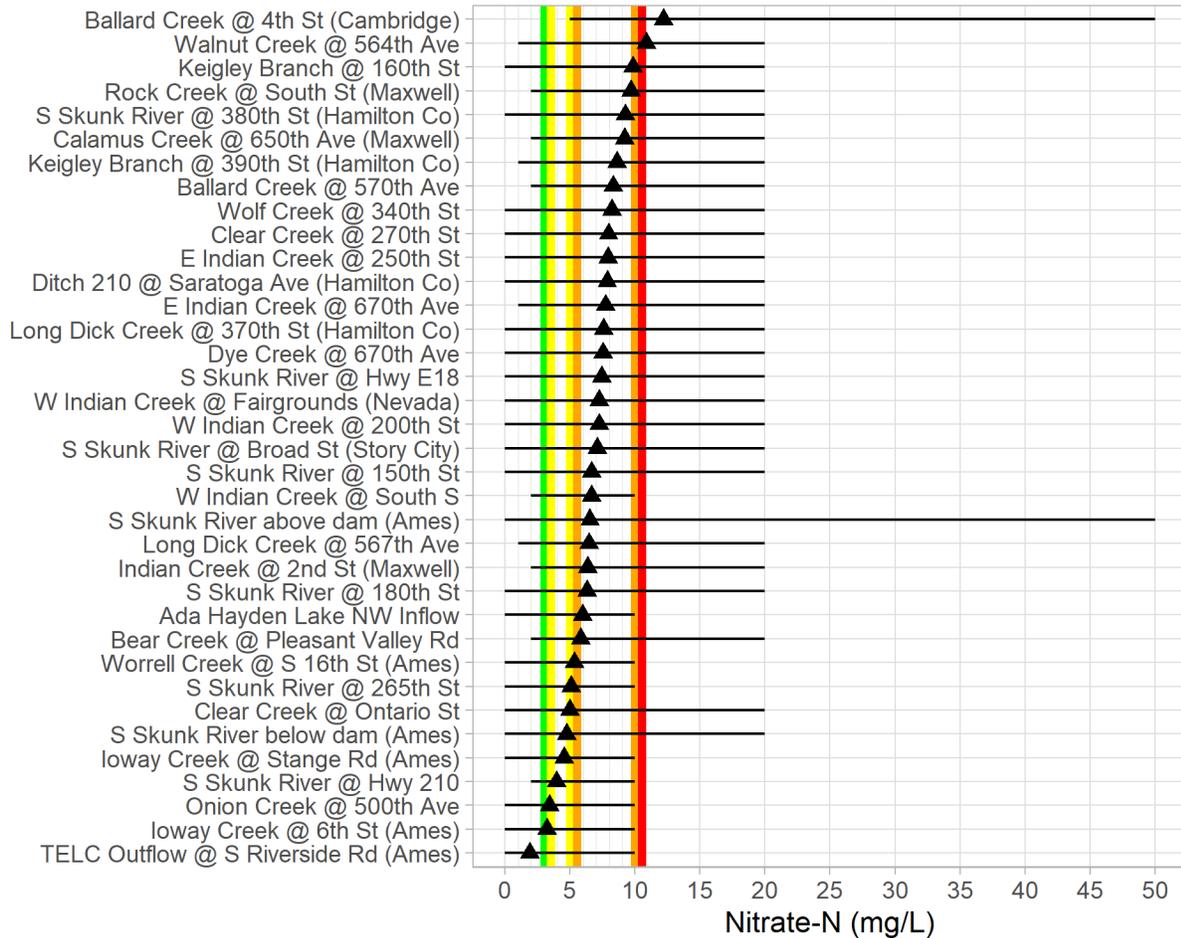
Nitrate concentrations of 20 mg/L or more were observed at 27 out of 36 sites this year, during late spring and early summer. However, many of these sites also had nitrate concentrations as low as 0 or 1 mg/L during dry periods in March, September and October. This strong seasonal pattern means that small streams like Walnut Creek that dry up in fall tend to have higher average nitrate than larger streams like the Skunk River that remain flowing. The exception is if a stream remains flowing because of effluent from a sewage treatment plant—this is the case for Ballard Creek and Rock Creek.

Phosphate

Most sites have average phosphate concentrations in the good to excellent range (less than 0.5 mg/L), but five sites were in the poor range (greater than 2.0 mg/L) and had some readings as high as 10 mg/L.

Volunteer phosphate results: range and mean
At least 12 samples
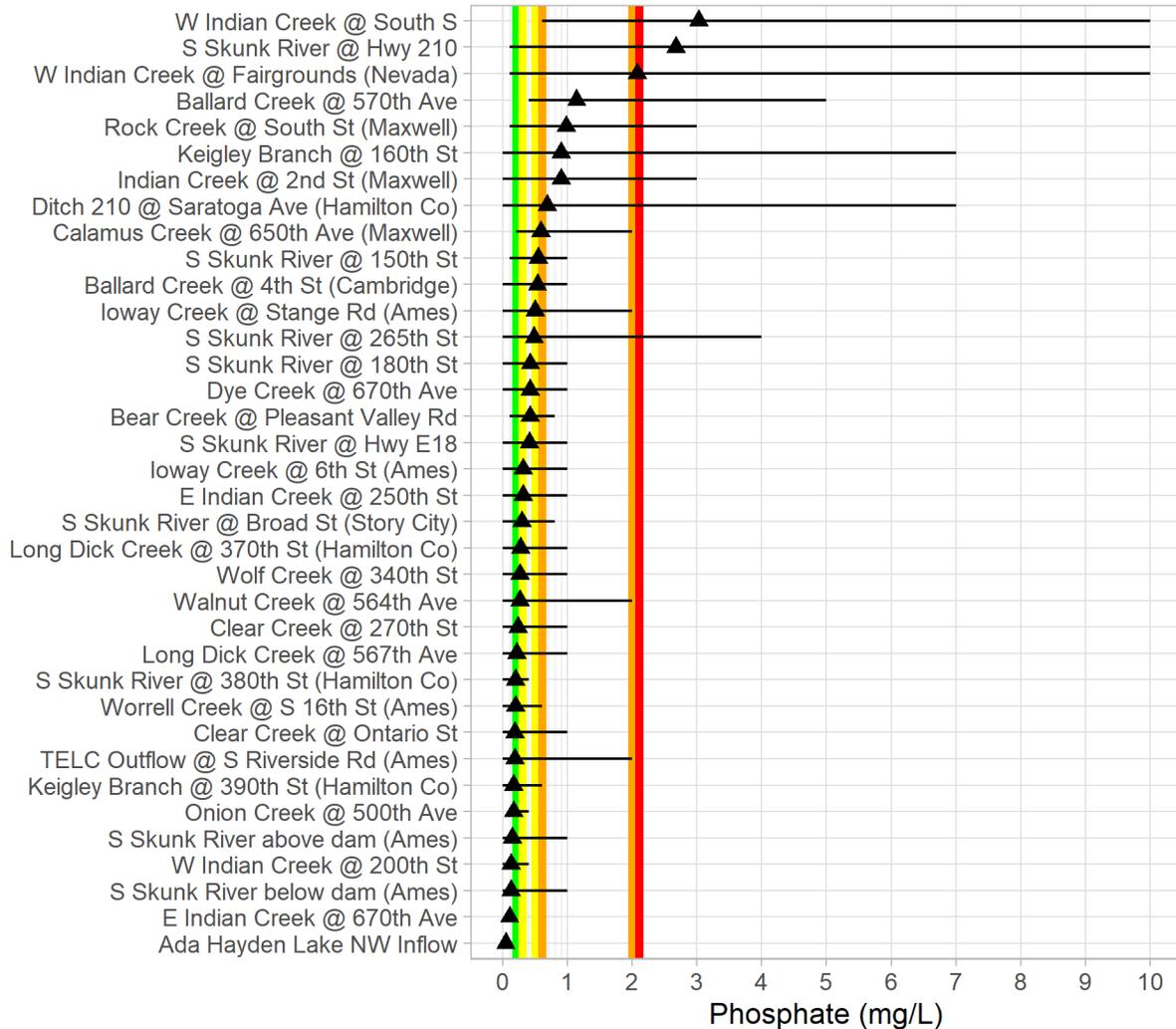
While phosphate can be attached to soil and carried with runoff, consistently high phosphate levels are usually the result of effluent from wastewater treatment plants (WWTP).

- W Indian Creek @ South S is just downstream of the Nevada WWTP and Indian Creek @ 2nd St may also be influenced by it
- S Skunk River @ Hwy 210 is just downstream of the Ames WWTP.
- Ballard Creek @ 570th St and 4th St are downstream of the Huxley WWTP.
- Rock Creek @ South St is just downstream of the Maxwell WWTP
- Ditch 210 is downstream of the Jewell WWTP

The reason for high average phosphate concentrations at the following sites is unclear and needs further investigation.

- West Indian Creek @ Fairgrounds (Nevada)
- Keigley Branch @ 160th St

Transparency/Turbidity

All 36 sites normally had clear water (median transparency in the good to excellent range). However, transparency at most sites varied widely over the course of the season. Twenty-seven of thirty-six sites (75%) had at least one sample in the "poor" range.

Volunteer transparency results: range and median
At least 12 samples
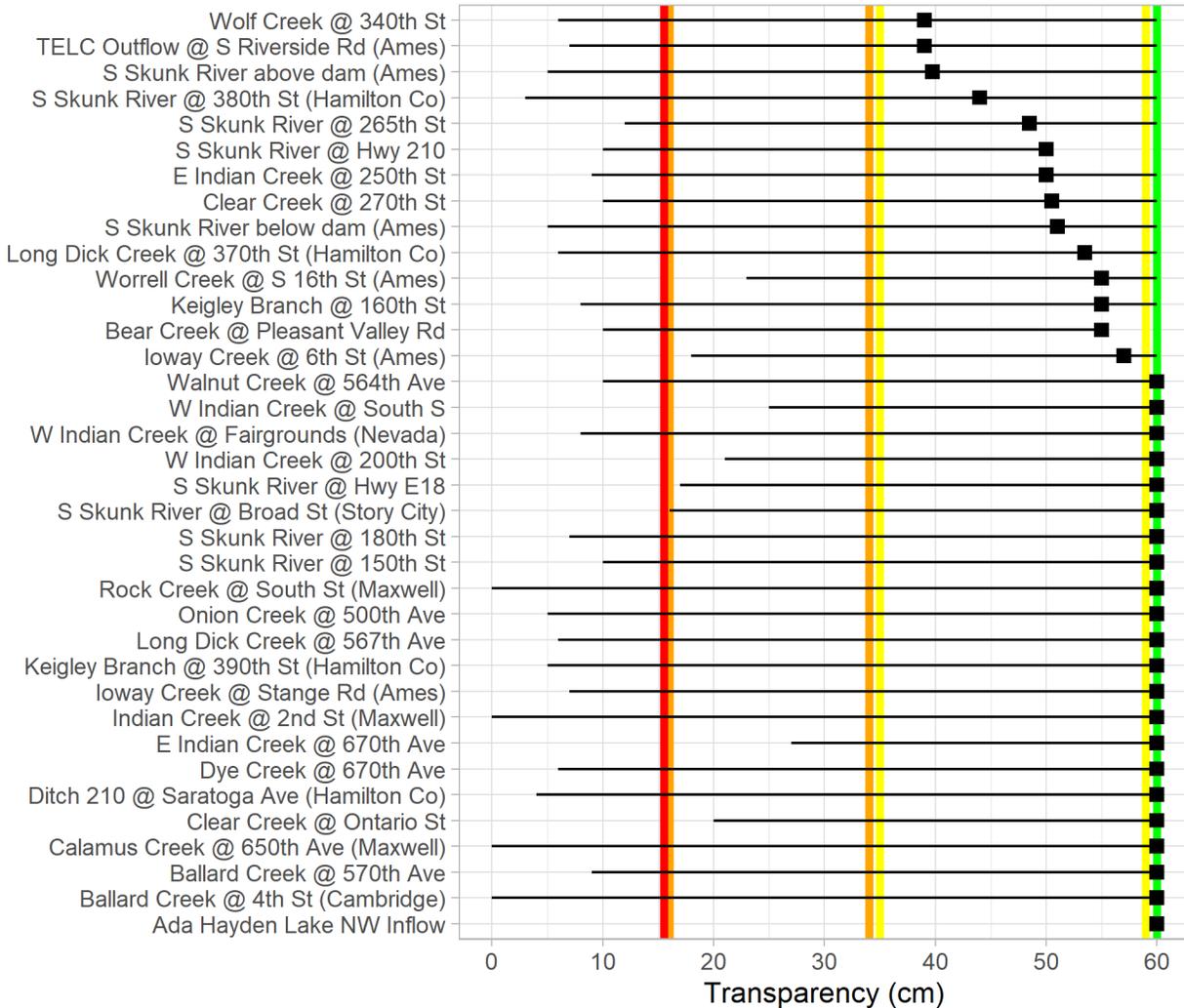
Dissolved oxygen

Median dissolved oxygen saturation was in the "good" to "excellent" range at 21 of 36 sites. However, even a temporary drop in dissolved oxygen can prove fatal for sensitive aquatic life. At least one "poor" reading was observed at 20 out of 36 sites. Low dissolved oxygen levels were most common between August and November, so were probably influenced by warm water temperature and low water levels.

Volunteer dissolved oxygen: median and range
At least 12 samples

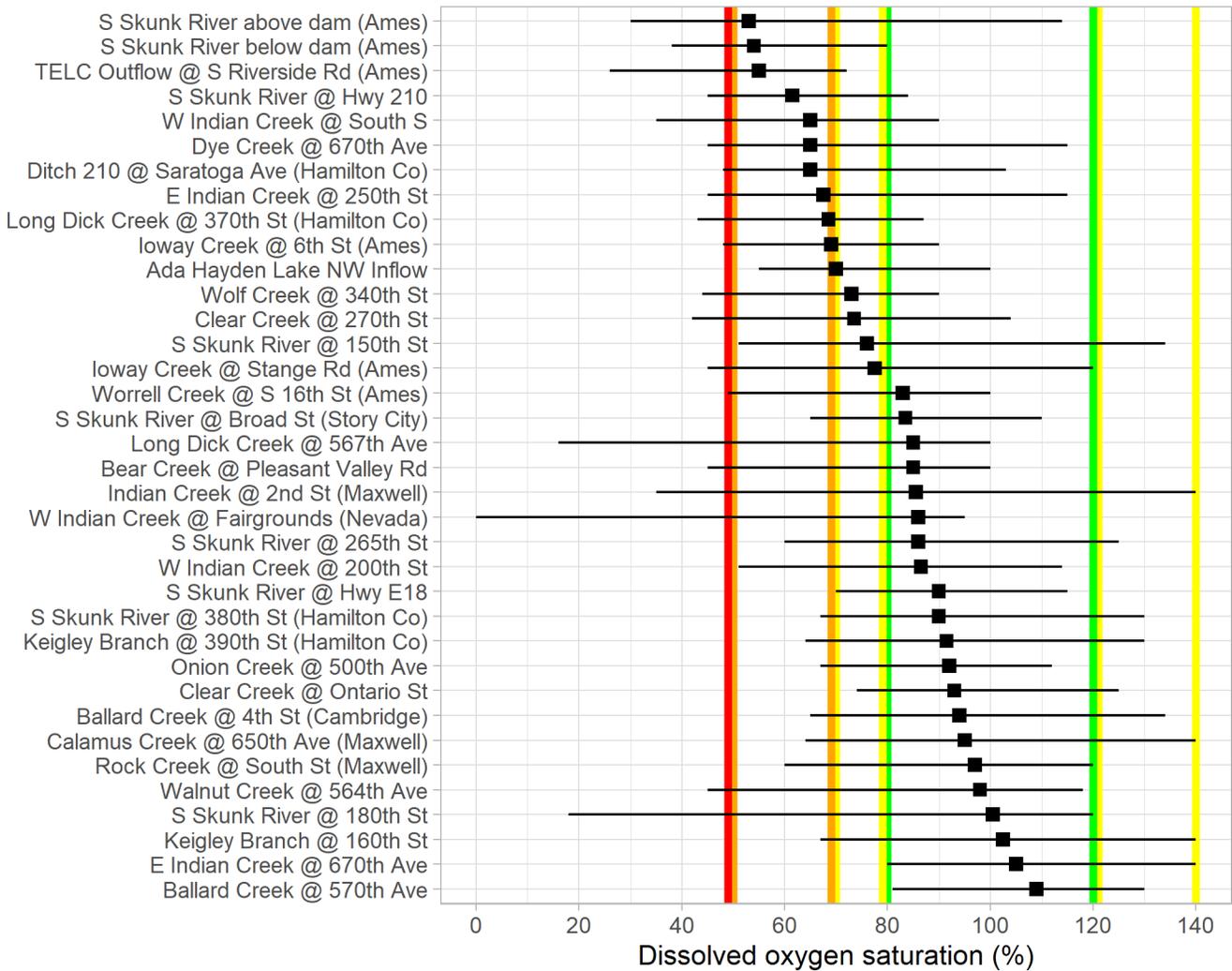| Site	
S Skunk River above dam (Ames)	
S Skunk River below dam (Ames)	
TELC Outflow @ S Riverside Rd (Ames)	
S Skunk River @ Hwy 210	
W Indian Creek @ South S	
Dye Creek @ 670th Ave	
Ditch 210 @ Saratoga Ave (Hamilton Co)	
E Indian Creek @ 250th St	
Long Dick Creek @ 370th St (Hamilton Co)	
Ioway Creek @ 6th St (Ames)	
Ada Hayden Lake NW Inflow	
Wolf Creek @ 340th St	
Clear Creek @ 270th St	
S Skunk River @ 150th St	
Ioway Creek @ Stange Rd (Ames)	
Worrell Creek @ S 16th St (Ames)	
S Skunk River @ Broad St (Story City)	
Long Dick Creek @ 567th Ave	
Bear Creek @ Pleasant Valley Rd	
Indian Creek @ 2nd St (Maxwell)	
W Indian Creek @ Fairgrounds (Nevada)	
S Skunk River @ 265th St	
W Indian Creek @ 200th St	
S Skunk River @ Hwy E18	
S Skunk River @ 380th St (Hamilton Co)	
Keigley Branch @ 390th St (Hamilton Co)	
Onion Creek @ 500th Ave	
Clear Creek @ Ontario St	
Ballard Creek @ 4th St (Cambridge)	
Calamus Creek @ 650th Ave (Maxwell)	
Rock Creek @ South St (Maxwell)	
Walnut Creek @ 564th Ave	
S Skunk River @ 180th St	
Keigley Branch @ 160th St	
E Indian Creek @ 670th Ave	
Ballard Creek @ 570th Ave	

Dissolved oxygen saturation (%)

Median dissolved oxygen saturation was below 70% (fair) at 13 sites, including the Tedesco Environmental Learning Corridor, Dye Creek, East Indian Creek, Long Dick Creek, and several locations on the South Skunk River. Strangely, the South Skunk River downstream of the former low-head dam at North River Valley Park in Ames had low dissolved oxygen levels (5-6 mg/L) even in April, May and June when water levels were high. We would expect the rapids to aerate the water. This is concerning and requires further investigation.

Chloride

Median chloride concentrations were below the detection limits at 7 sites and in the good to excellent range at 34 of 36 sites. The exceptions were West Indian Creek @ South S (below the Nevada WWTP) and Ballard Creek @ 570th St (below the Huxley WWTP), which were in the fair range. Salt from water softeners is impossible to remove from wastewater and can be a major source of chloride. Ditch 210 and the South Skunk River at Hwy 210 are also influenced by wastewater. The timing of higher-than-normal chloride readings at some sites is consistent with deicing salts and snowmelt (March or December) but not all.


Volunteer chloride results: range and median
At least 12 samples
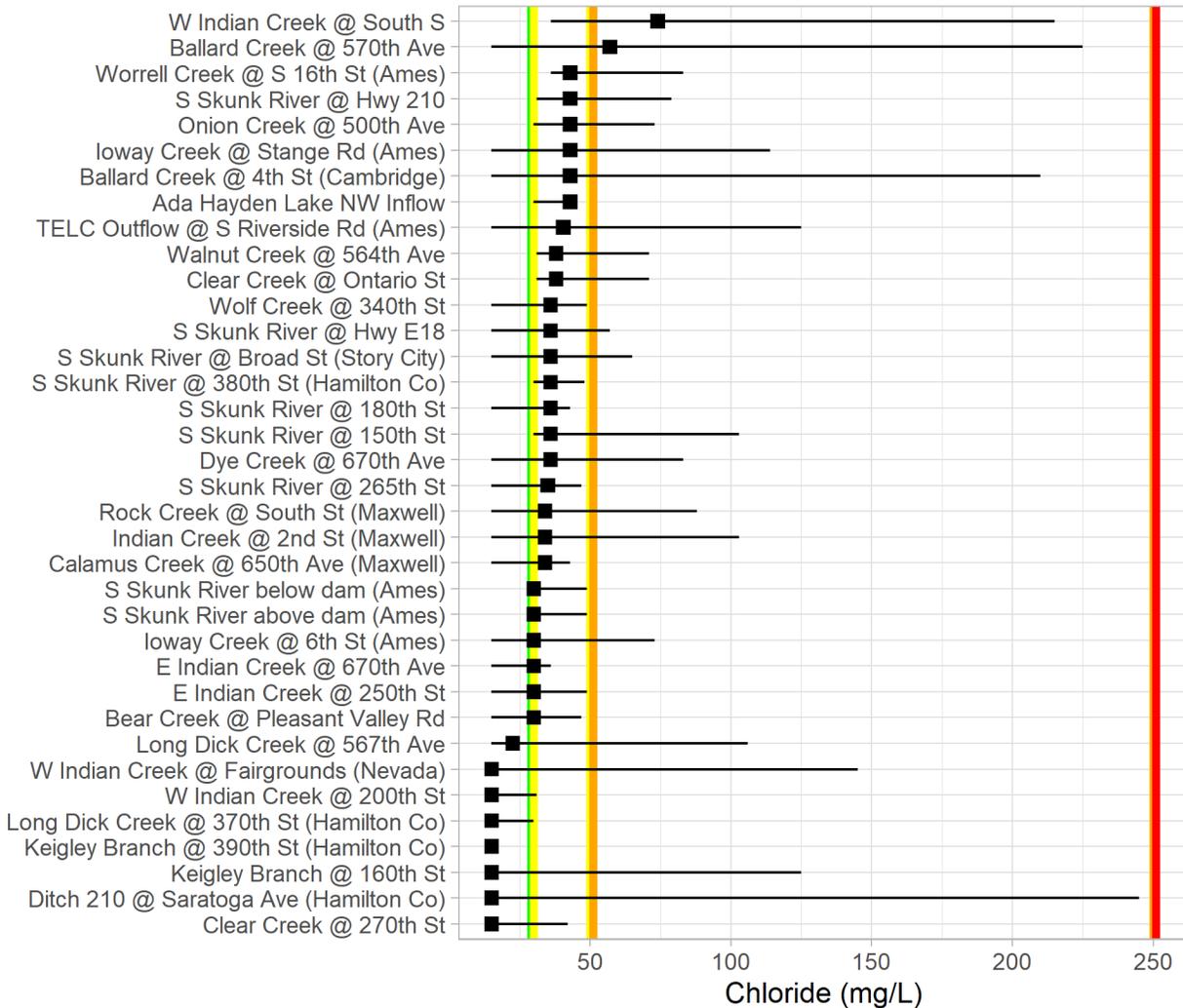
pH (acidity/alkalinity)

Most Iowa waters are slightly basic to moderately basic in their natural condition (pH 7.5 to 8.5), because of minerals in the groundwater. The pH thresholds used by the national program may not be appropriate for Iowa, since an 8.5 on a test strip may be read as a 9 and scored as "fair.
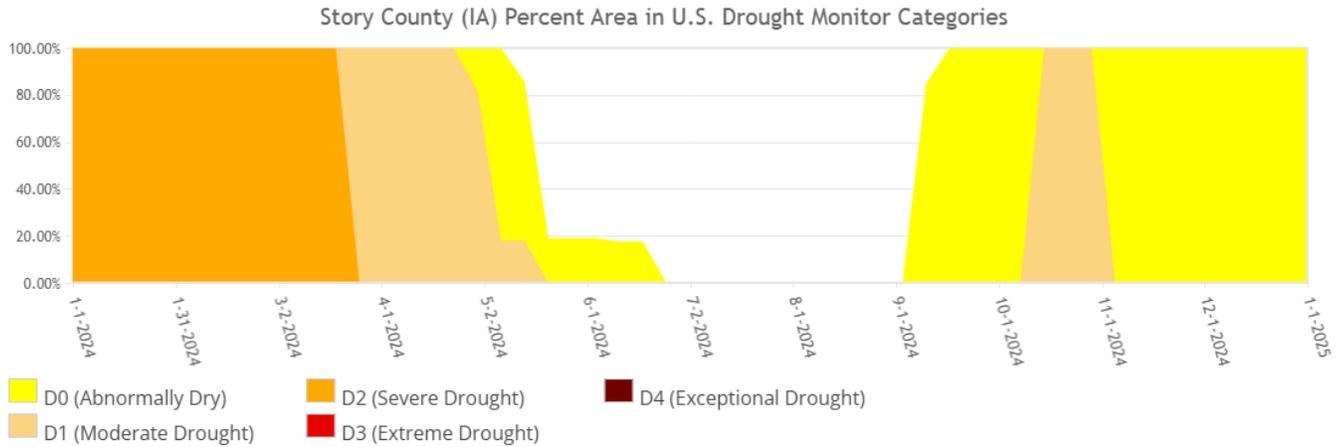
Volunteer pH (acidity): median and range
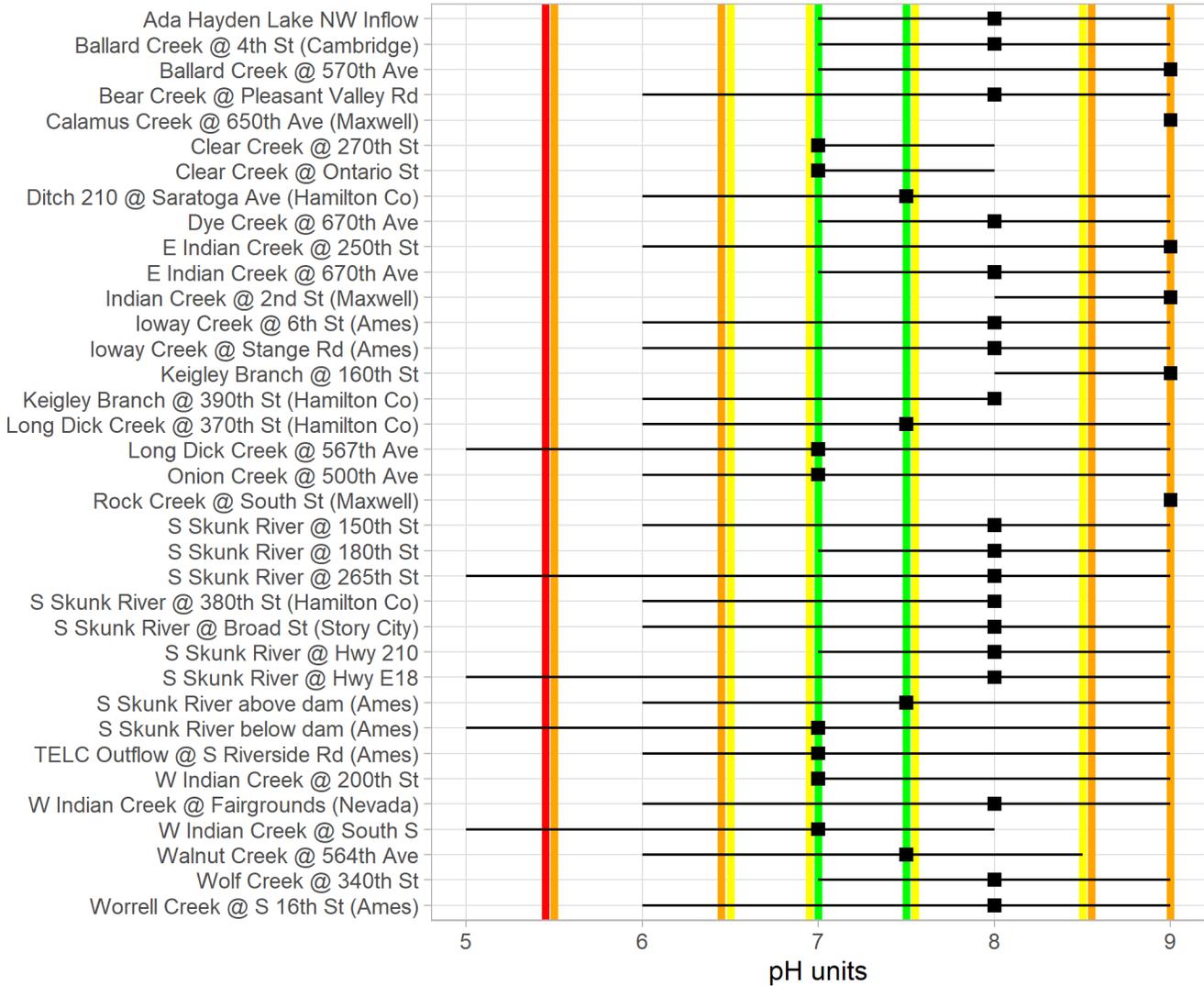
However, the acidic water (pH of 5) at five sites is a cause for concern. This was observed at three sites on the South Skunk River, Long Dick Creek, and West Indian Creek. Algae growth can cause large changes in pH that can stress aquatic organisms. We see a wide variation in pH (three or four units) at nineteen sites.

Weather and water levels, 2024

According to the US Drought Monitor[8], Story County was in severe drought from January through mid-March. The drought had broken in most parts of the county by early May but abnormally dry conditions returned in September. The US Drought Monitor considers physical indicators like precipitation, streamflow, and soil moisture, as well as field observations of drought stress and interpretation by local experts.

Story County (IA) Percent Area in U.S. Drought Monitor Categories

D0 (Abnormally Dry)   D2 (Severe Drought)   D4 (Exceptional Drought)
D1 (Moderate Drought)   D3 (Extreme Drought)

From the U.S. Drought Monitor website, https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx, 3-17-2025

The South Skunk River near Ames always has a seasonal pattern in water levels, but was lower than normal in January, March, September and October. It was higher than normal in May, early February, and early August.

USGS 05471000 South Skunk River below Ioway Creek near Ames, IA

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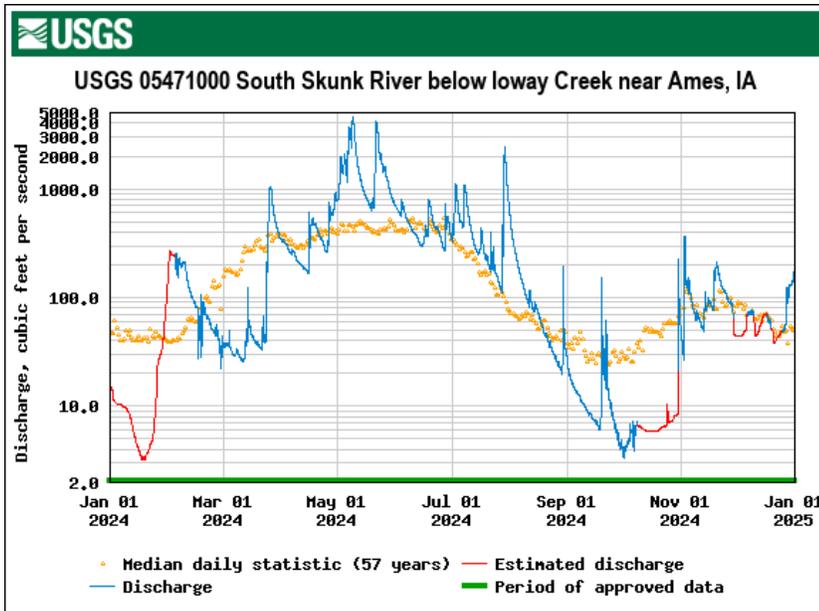
[8] https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?fips_19169

The Sleepy Hollow canoe access on the South Skunk River upstream of Ames has a USGS gage nearby (USGS 05470000) and lines painted on the access ramp that show the range of water levels that would be suitable for canoeing or kayaking. Water levels were suitable for paddling on 5 of the 12 days when we tested this site in 2024, and 16 out of 56 days we tested over the past five years. In previous reports, I used these thresholds to color code water quality measurements at all our lab sites and look separately at water quality averages during high, middle, and low flows.

Streamflow during monthly water testing, 2020-2024
South Skunk River above Ames (USGS05470000)

Flow on days sampled
- Too high for paddling
- Suitable for paddling
- Too low for paddling
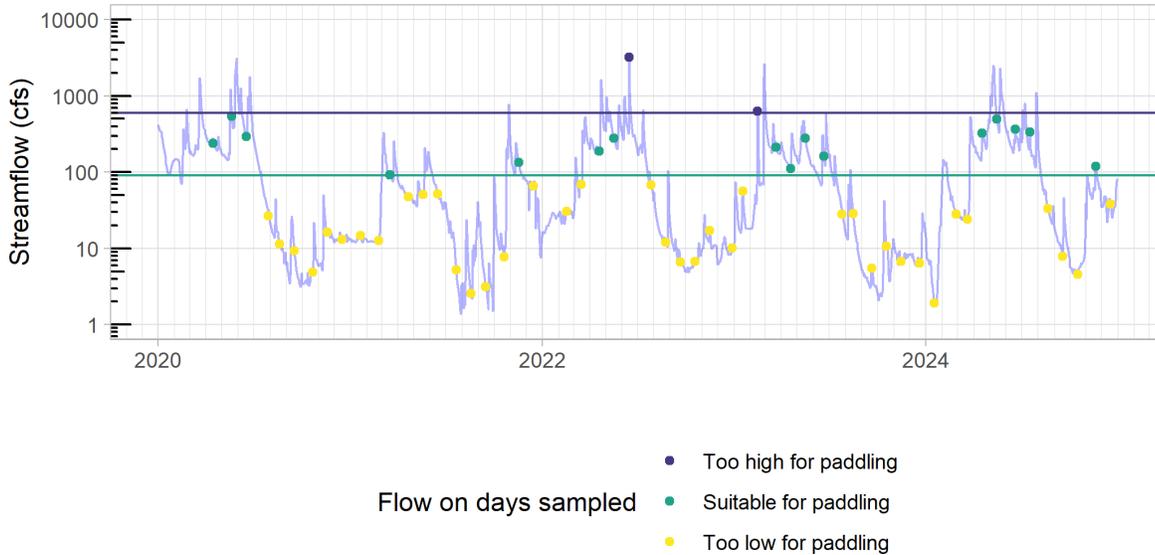
My assumption was that rivers across Story County rise and fall together. A closer look at gages on the South Skunk River downstream of Ames (05471000), on Ioway Creek (0570500) and on Indian Creek (05471200) shows this assumption to be true. However, one river may rise more than the others, either due to patchy rainfall or a difference in how much of the rain runs off the land surface.

Streamflow at USGS gages, normalized by watershed area
South Skunk River, Ioway Creek, and Indian Creek in 2024

USGS gage number
- 05470000
- 05470500
- 05471000
- 05471200
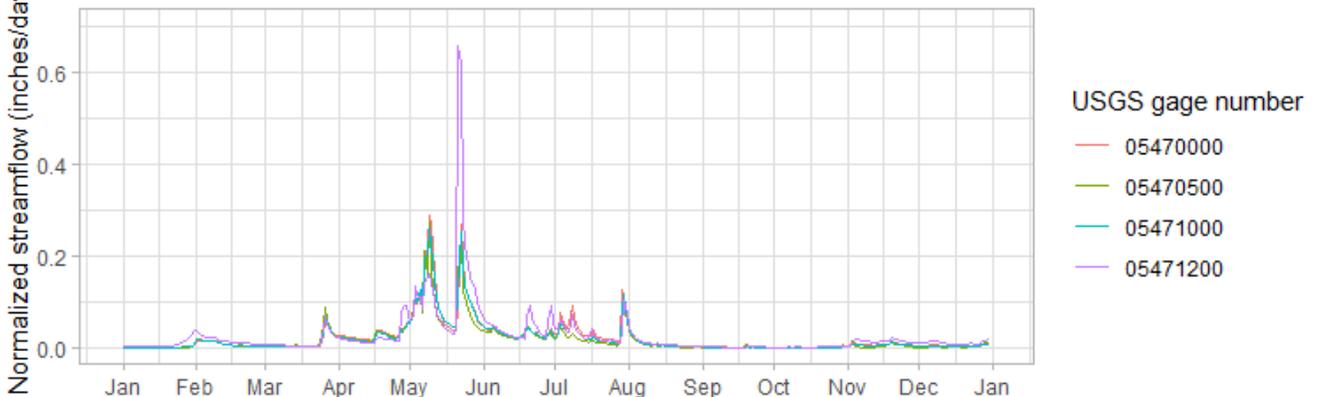
For this report, I'm trying a different approach. I have selected four days from the past five years that I think best illustrate how runoff, tile drainage, snowmelt, or wastewater can influence water quality. For those days, I have calculated the total amount of pollution passing down the South Skunk River, and the fraction of that pollution that comes from different locations.
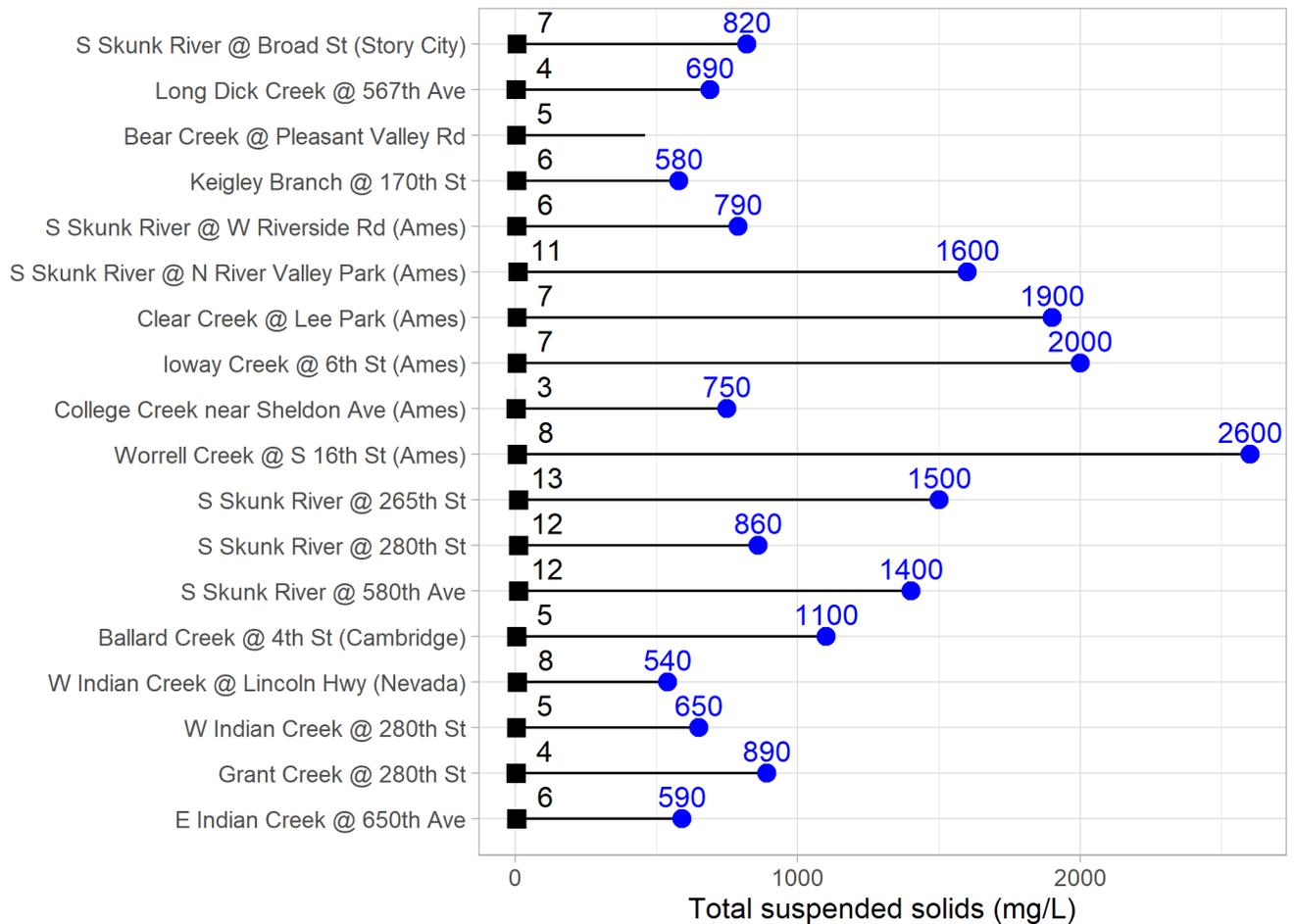
Lab Testing, 2020-2024

Total suspended solids

Too much sediment in the water can harm aquatic life and eliminate quality habitat (i.e. covering up rocks with silt). Sediment in the water is also an indication of the severity of erosion in the watershed or within the stream corridor. Total suspended solids (TSS) is one of several ways to measure sediment in the water, in this case, the dry weight of solids that settles out of a water sample.

Sediment (2020-2024), median and range
Highlighting flash flooding on June 15, 2022

| Location	Median	Max
S Skunk River @ Broad St (Story City)	7	820
Long Dick Creek @ 567th Ave	4	690
Bear Creek @ Pleasant Valley Rd	5	
Keigley Branch @ 170th St	6	580
S Skunk River @ W Riverside Rd (Ames)	6	790
S Skunk River @ N River Valley Park (Ames)	11	1600
Clear Creek @ Lee Park (Ames)	7	1900
Ioway Creek @ 6th St (Ames)	7	2000
College Creek near Sheldon Ave (Ames)	3	750
Worrell Creek @ S 16th St (Ames)	8	2600
S Skunk River @ 265th St	13	1500
S Skunk River @ 280th St	12	860
S Skunk River @ 580th Ave	12	1400
Ballard Creek @ 4th St (Cambridge)	5	1100
W Indian Creek @ Lincoln Hwy (Nevada)	8	540
W Indian Creek @ 280th St	5	650
Grant Creek @ 280th St	4	890
E Indian Creek @ 650th Ave	6	590

Total suspended solids (mg/L)

Streams in Story County are normally quite clear, with median TSS ranging from 3 to 22 mg/L (the black squares on the figure below). However, sediment concentrations can be ten or a hundred times greater after heavy rains. We observed the highest concentrations of suspended solids on June 15, 2022 after a 2 inch rainstorm the previous night and morning.

The South Skunk River briefly reached flood stage at the S. 16th St gage in Ames and two upstream gages reached the action level while we were sampling. Bear Creek had flooded Pleasant Valley Road, so we sampled at W. Maple St in Roland (not shown), measuring 390 mg/L TSS. Sediment concentrations were especially high in Worrell Creek and other sites affected by runoff from paved surfaces in Ames.

Weekly data from sites on the South Skunk River shows how suspended solids concentrations increase with streamflow.

## Sediment concentration vs. streamflow (2020-2024)
Highlighting flash flooding on June 15, 2022
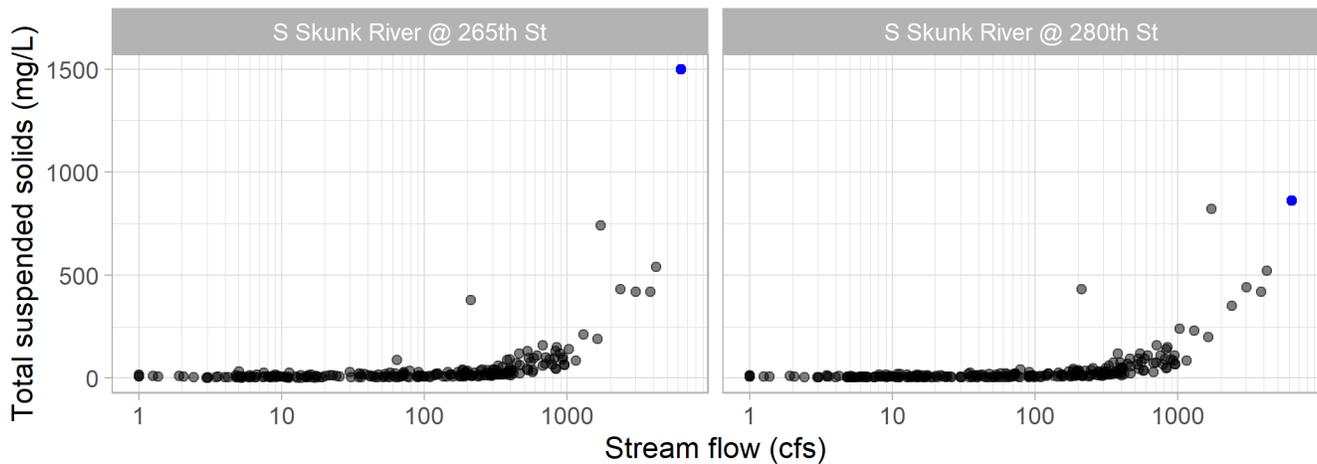
We can calculate the amount of sediment washed downstream on days we tested by multiplying concentration by streamflow at the nearest gage (with some adjustments to account for the size of the watershed). At 265th St, more sediment moved in that one day than during the rest of the year combined! A large fraction of the sediment came from Ioway Creek.

Sediment load vs. streamflow (2020-2024)
Highlighting flash flooding (6/15/2022)

29
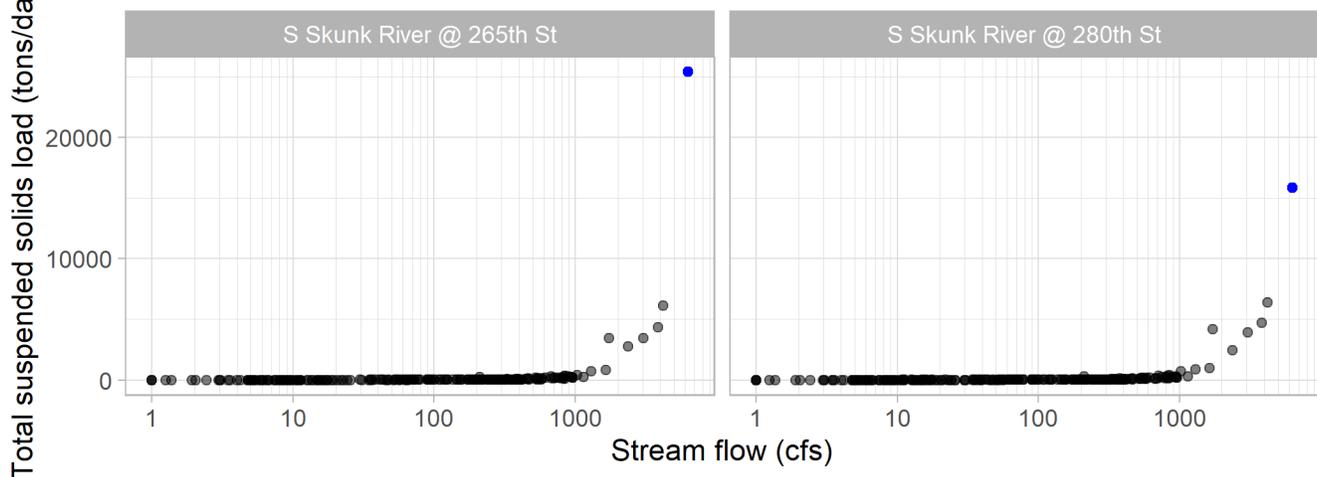
However, what do we make of the difference between sites during the flood event? Was 10,000 tons of sediment actually removed from the South Skunk River between 265th St and 280th St? A more likely explanation is timing—the 280th St site was sampled at 7:33AM, the 580th St site was sampled at 7:45AM, and the 265th St site was sampled at 8:05AM. During the half hour it took to get to the upstream site, water levels at the gage had risen a half a foot, and the water could have gotten muddier as well. Ioway Creek and its tributaries were sampled between 9 and 10AM. The Indian Creek tributaries were sampled between 12PM and 2PM, by which point water levels may have been going back down. During major storm events, a single grab sample may not be representative. If precise measurements of sediment load is needed, an auto-sampler or real-time turbidity sensors may be a better option.
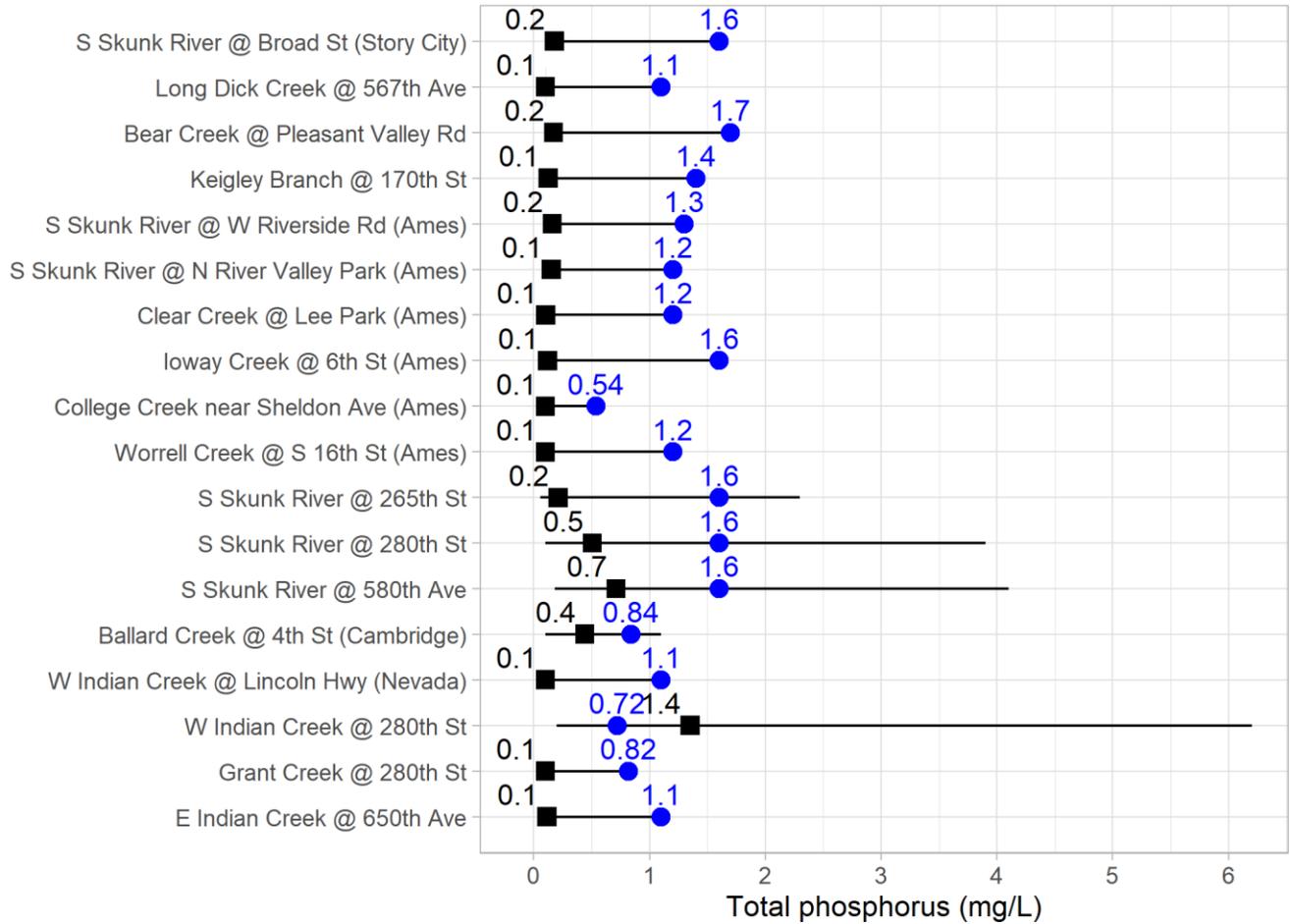
Phosphorus

Phosphorus is an essential plant nutrient. Excess nitrogen and phosphorus in lakes and rivers can lead to harmful algae blooms, and hypoxia in the Gulf of Mexico. In streams, algae is also limited by temperature and the availability of light. On March 12, 2024, we observed what appeared to be a cyanobacteria bloom in the South Skunk River, starting just upstream of Ames. While filamentous algae is a common sight on the rocks on streams in Story County, this was the first time we had seen the water turn green. Unseasonably hot weather before the trees had leafed out probably contributed to the algae growth. We did test phosphate with a field kit (measuring 0 mg/L) but the bloom was already starting to disperse and die off, so a short-term spike in pollution could have occurred earlier in the week.

The lab measures total phosphorus, which includes both dissolved forms and forms bound to sediment. There are no state standards for phosphorus in streams. Here we are most concerned with which streams have higher and lower phosphorus concentrations. Note that the minimum detection limit of our tests is usually 0.1 mg/L.

In most streams we test, phosphorus is normally less than 0.2 mg/L but can rise to over 1 mg/L after a rainstorm. Due to a supply chain issue, we were not able to test for phosphorus during the flash flooding in June 2022, so here I've illustrated our next largest runoff event. On February 15, 2023 a combination of snowmelt and 0.9 inches of rain caused Ioway Creek, the South Skunk River, and the Indian Creek to all rise by about 2 feet.
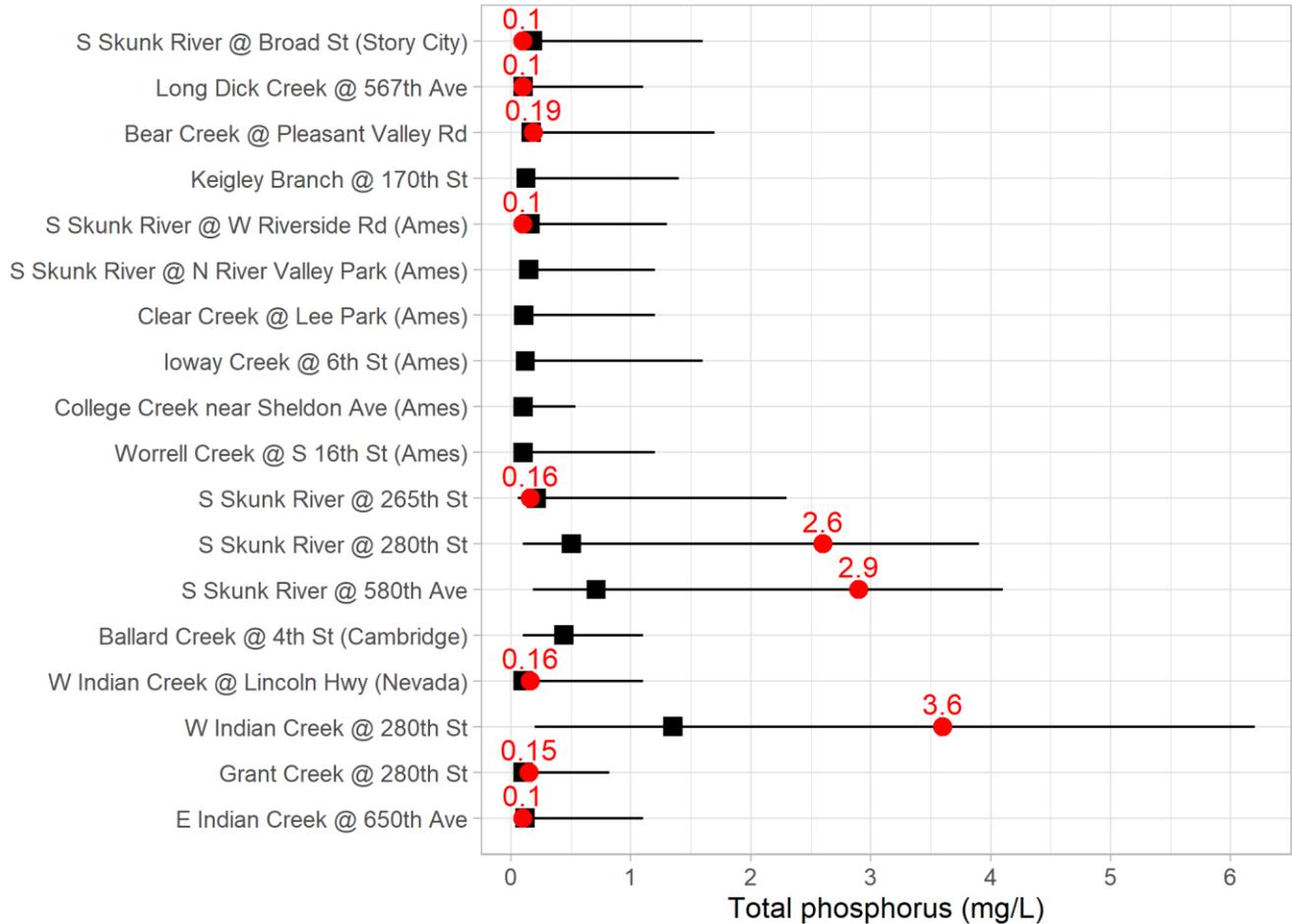

Phosphorus (2020-2024), median and range
Highlighting snowmelt (2/15/2023)

However, during a multi-year drought, we've noticed consistently high phosphorus levels in the South Skunk River downstream of the Ames sewage treatment plant and in West Indian Creek downstream of the Nevada sewage treatment plant. Ballard Creek also has elevated phosphorus levels due to effluent from the City of Huxley but often dries up completely at our sampling location in Cambridge. Our highest ever phosphorus reading (6.2 mg/L) was collected in West Indian Creek on October 19, 2022, but several other sites could not be sampled due to ice, so I've highlighted another dry fall day: October 16, 2024. On this day, Ioway Creek and five other sites were not flowing.

Phosphorus (2020-2024), median and range
Highlighting drought (10/16/2024)

| Site	Value
S Skunk River @ Broad St (Story City)	0.1
Long Dick Creek @ 567th Ave	0.1
Bear Creek @ Pleasant Valley Rd	0.19
Keigley Branch @ 170th St	
S Skunk River @ W Riverside Rd (Ames)	0.1
S Skunk River @ N River Valley Park (Ames)	
Clear Creek @ Lee Park (Ames)	
Ioway Creek @ 6th St (Ames)	
College Creek near Sheldon Ave (Ames)	
Worrell Creek @ S 16th St (Ames)	
S Skunk River @ 265th St	0.16
S Skunk River @ 280th St	2.6
S Skunk River @ 580th Ave	2.9
Ballard Creek @ 4th St (Cambridge)	
W Indian Creek @ Lincoln Hwy (Nevada)	0.16
W Indian Creek @ 280th St	3.6
Grant Creek @ 280th St	0.15
E Indian Creek @ 650th Ave	0.1

Total phosphorus (mg/L)

The Ames Water Pollution Control Facility discharges around a 6 million gallons per day of treated effluent (9 cubic feet per second), containing about 200 pounds of phosphorus[9] (around 4 mg/L). Sewage treatment plants in Story City and other upstream communities account add approximately 20 pounds per day.

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[9] Effluent monitoring data for the Ames Water Pollution Control Facility can be found here:
 https://echo.epa.gov/effluent-charts#IA0035955

When water levels are low, like October 16, 2024, treated effluent can account for over half the water in the stream and over 95% of the phosphorus load, but that load is very small. When water levels are high, like on February 15, 2023, phosphorus load in the South Skunk River is much larger, and effluent accounts for less than 2% of it. Over the long-term, sewage treatment plants and other point sources of pollution are estimated to contribute about 15% of the phosphorus load exported to the Gulf of Mexico but they can contribute to chronically high phosphorus concentrations in some of our rivers.
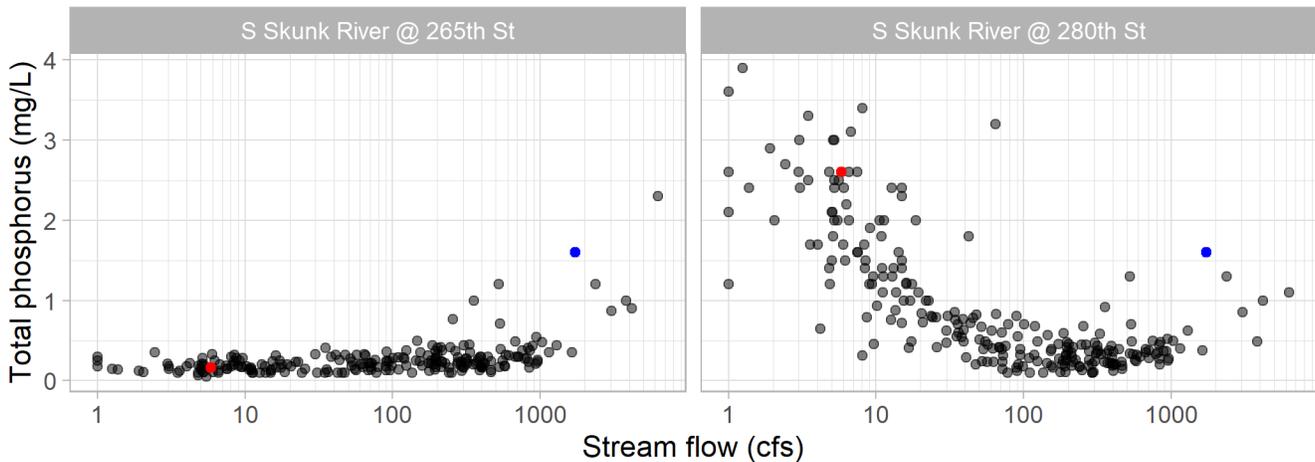
Phosphorus load vs. streamflow (2020-2024)
Highlighting drought (10/16/2024) and snowmelt (2/15/2023)
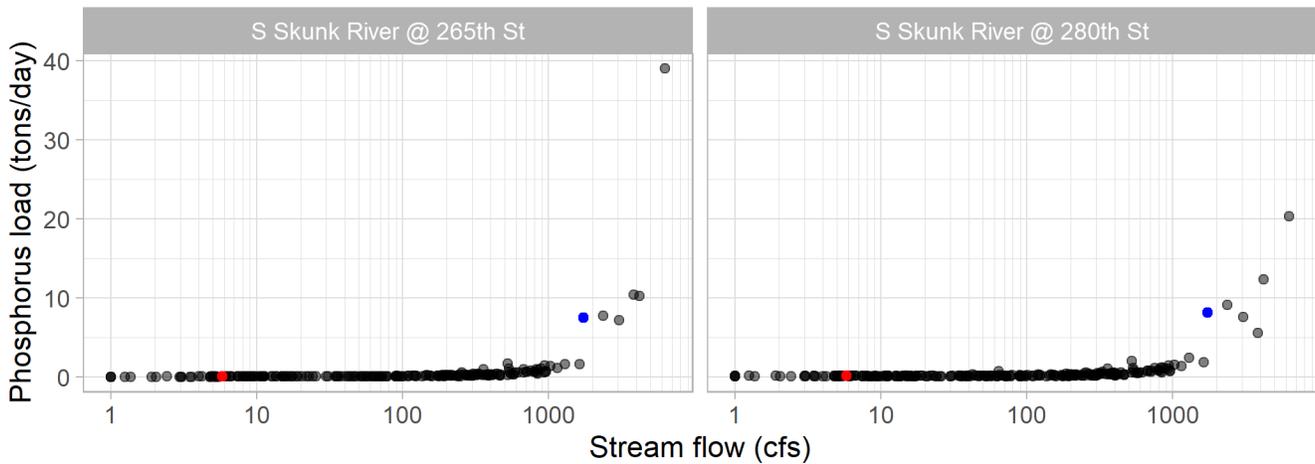
Phosphorus concentration vs. streamflow (2020-2024)
Highlighting drought (10/16/2024) and snowmelt (2/15/2023)

In 2024, the City of Ames broke ground on the first phase of $53 million project at the Water Pollution Control Facility. The final phase of the project should reduce phosphorus discharge from the plant by 75%, but this will not be completed until 2039.

Nitrate

Nitrate is the most water-soluble form of nitrogen, an essential plant nutrient. Excess nitrogen and phosphorus in lakes and rivers can lead to harmful algae blooms, and to hypoxia in the Gulf of Mexico. Note that the minimum detection limit of our tests is usually 1 mg/L. These streams are not used as a source for public drinking water supplies, so the 10 mg/L drinking water standard would not apply, and there are no other relevant state standards. Here we are most concerned with how nitrate in one stream compares to others and across time.

At most of our sites, we observed the highest nitrate concentrations on June 19, 2024. This was a week after heavy rains, so rivers would no longer be affected by runoff, but drainage tiles would be flowing. Note the large difference between Long Dick Creek and the South Skunk River near Story City and nearby Bear Creek and Keigley Branch.

Nitrate (2020-2024), median and range
Highlighting tile flow on May 15, 2024
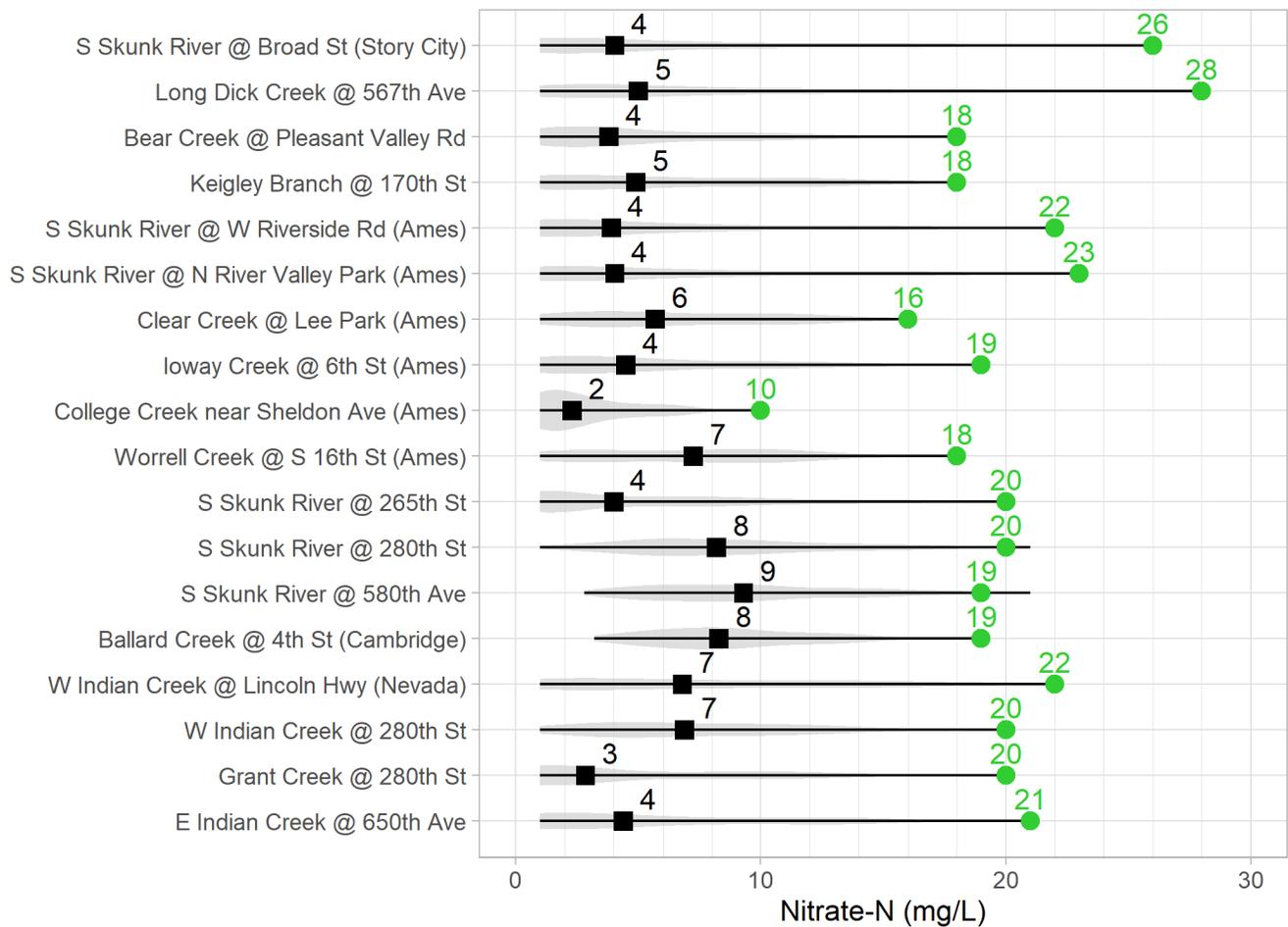
Bear Creek is well-known for riparian buffer and saturated buffer research and demonstration sites. A recent assessment of Keigley Branch and Long Dick Creek by Kyle Ament of the Iowa DNR found a large difference in cover crop acres.
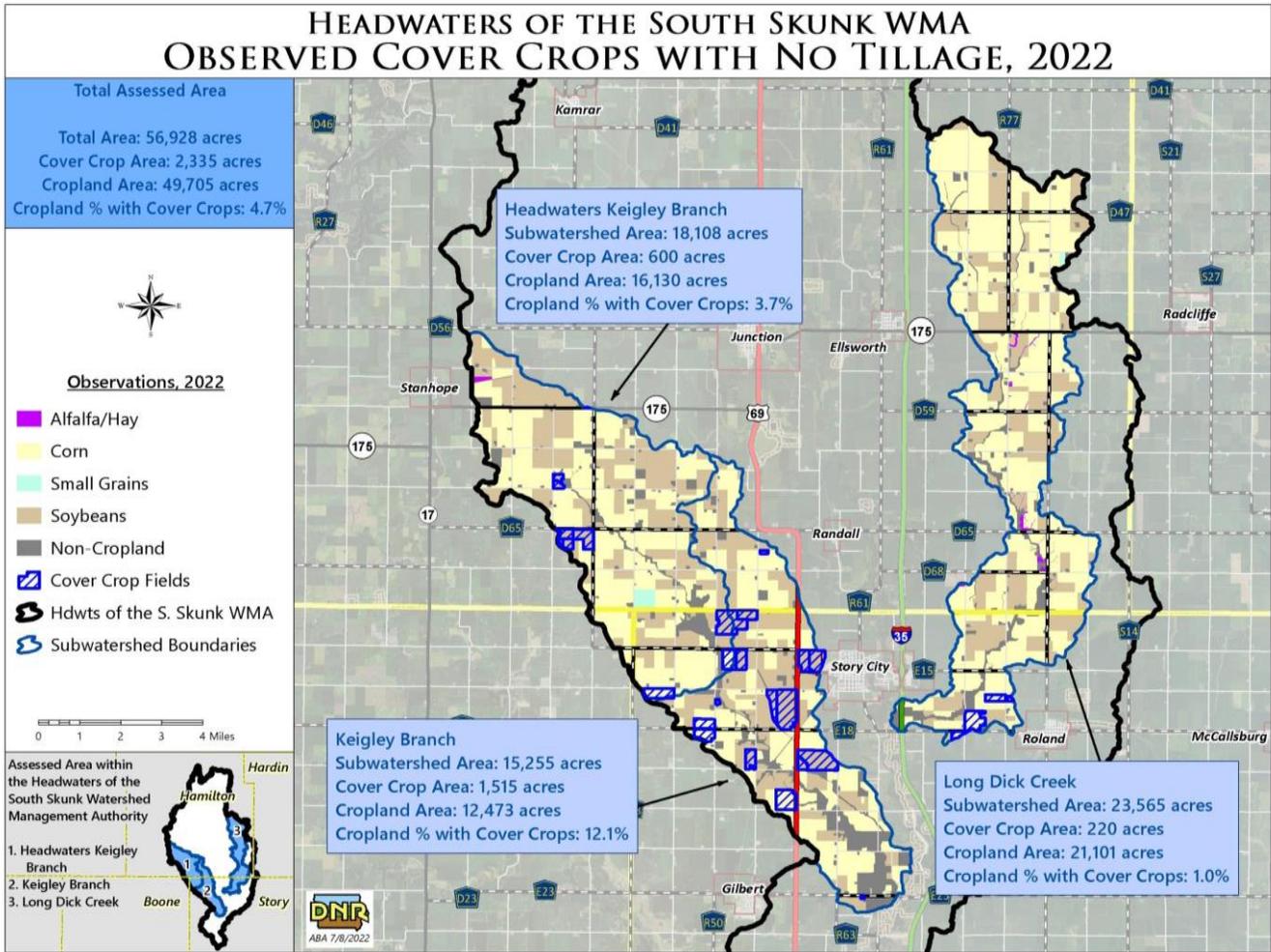
Average nitrate concentrations are noticeably lower in Keigley Branch during wet years, but total phosphorus and TSS concentrations are higher.

Metric	Keigley Branch	Long Dick Creek
Percent of watershed in row crops	86%	90%
Percent of cropland in cover crops	7%	1%
2024 (the wettest year)		
Average nitrate	8.8 mg/L	11.7 mg/L
Average total phosphorus	0.2 mg/L	0.1 mg/L
Average TSS	37.5 mg/L	10.2 mg/L
2021 (the driest year)		
Average nitrate	5.7 mg/L	5.9 mg/L
Average total phosphorus	0.2 mg/L	0.1 mg/L
Average TSS	3.6 mg/L	3.7 mg/L

This conflicts with the results of a RUSLE model, which predicted that Keigley Branch would have lower sheet and rill erosion and sediment delivery ratios (3% vs 4%). The model does not account for streambank erosion, which could be higher in Keigley Branch. Another possibility is that water quality averages are not representative--sediment concentrations were higher in Long Dick Creek during flash flooding in 2022, and events like this would account for most of the erosion.

Effluent from the Ames Water Pollution Control Facility contains about 1500 pounds per day of total nitrogen, with concentrations of 20 to 30 mg/L. As with phosphorus, that can range from a large fraction of the nitrogen in the river during a drought to a tiny fraction of the nitrogen load when water levels are high. Most of the nitrogen load comes from the Headwaters of the South Skunk River watershed. On May 15, 2024 it accounted for 58,700 pounds (52% of the load at 280th St). On June 15, 2024, it accounted for 145,900 pounds (62%).

Nitrate load vs. streamflow (2020-2024)
Highlighting tile flow on May 15, 2024
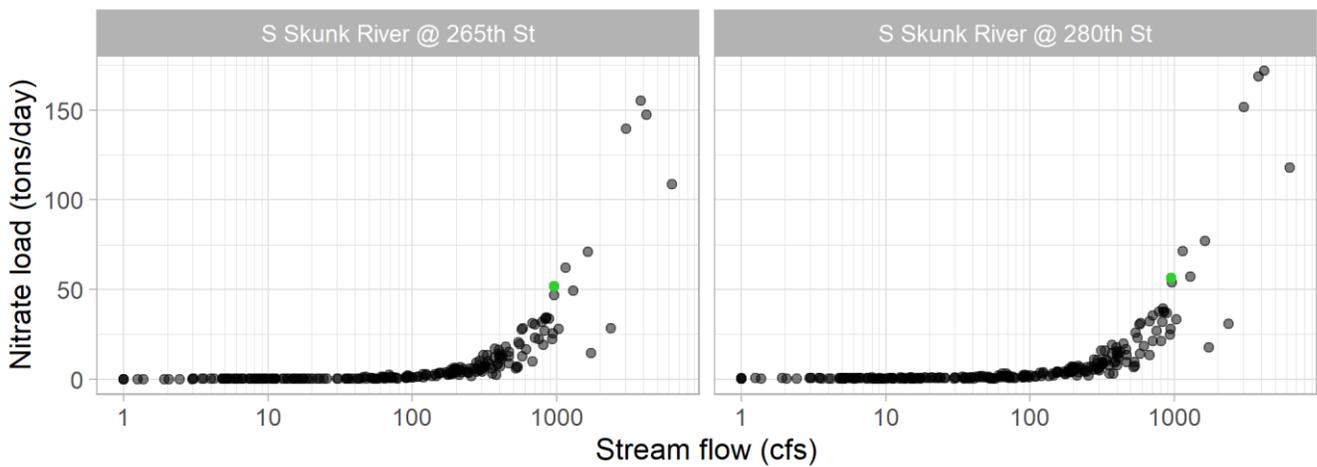
Peak nitrate concentrations do not coincide with peak nitrate loads. Above 1000 cubic feet per second, nitrate concentrations in the South Skunk River drop off, indicating a dilution effect. As a result, nitrate loads are less driven by a few large events than total suspended solids.

Nitrate concentration vs. streamflow (2020-2024)
Highlighting tile flow on May 15, 2024
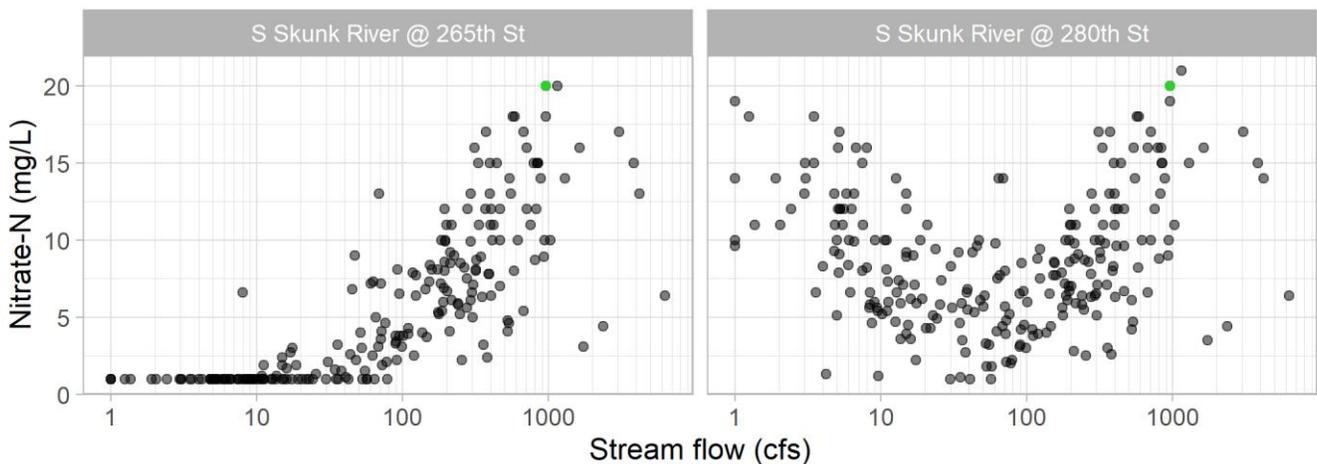
Fecal Indicator Bacteria

E. coli is a bacteria found in the guts and feces of humans, other mammals, and birds. Because it is abundant in feces and easy to culture, we test it as an indicator of fecal contamination and a stand-in for a variety of other pathogens that could make people sick if they ingest contaminated water while recreating. *E. coli* counts may be measured and recorded as Colony Forming Units (CFU) or Most Probable Number (MPN) per 100 mL but they are equivalent.

2024 Recreational Season

The state standard for primary contact recreation or children's recreation has two components, which apply only during the recreational season (March 15-November 15).

- Individual *E. coli* samples collected during the season should not exceed 235 MPN/100mL.
- The geometric mean of all samples collected during the season should not exceed 126 MPN/100mL. At least seven samples are needed to apply the standard.

Only one of the two swimming beaches and none of the streams we tested met this standard.

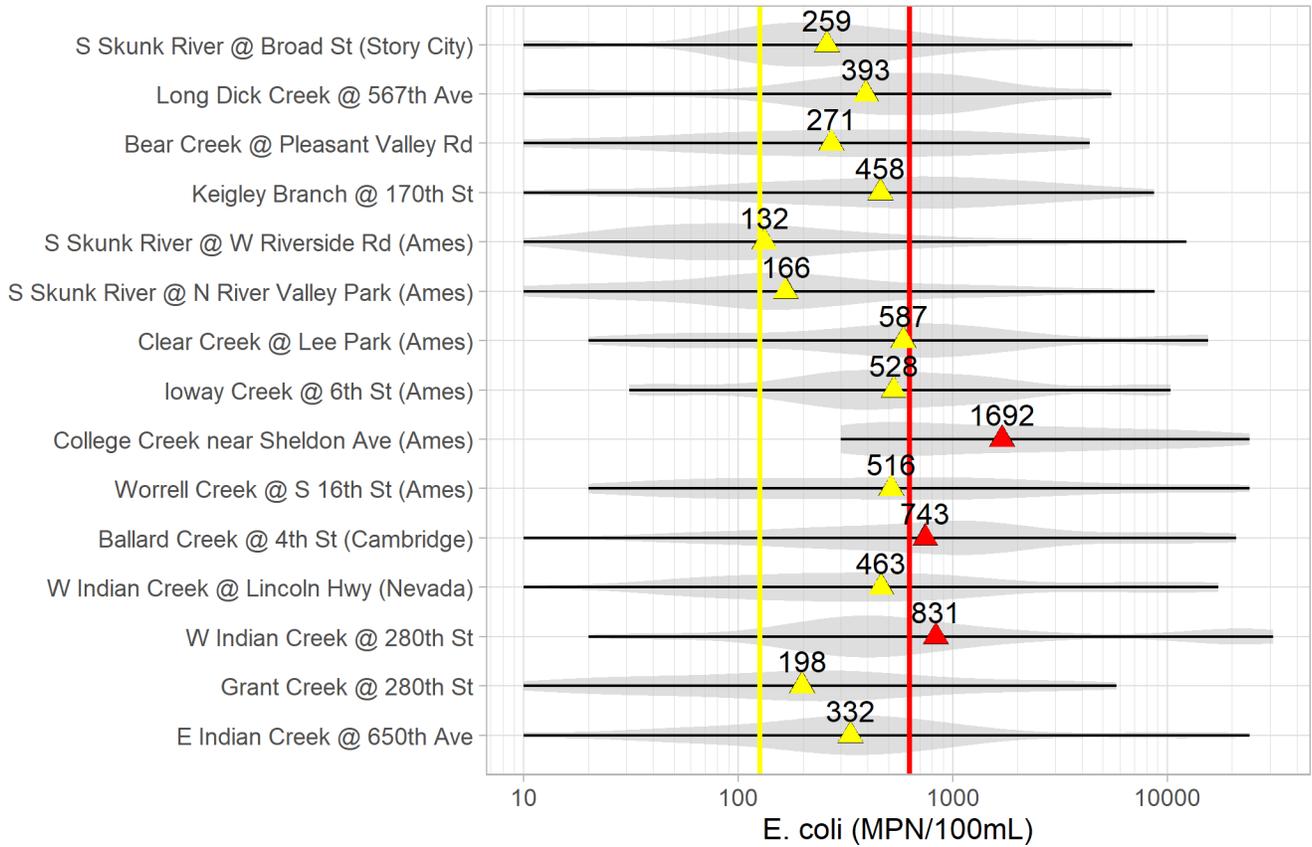| Site	Geometric mean (MPN/100ml)	Samples Exceeding 235	Samples Exceeding 2,880
Peterson Park Beach	19	0 of 15	0 of 15
Exceeds primary contact standard (126 MPN/100 mL)			
Hickory Grove Beach	126	4 of 15	2 of 15
Grant Creek @ 280th St	201	5 of 8	1 of 8
S Skunk River @ N River Valley Park (Ames)	281	4 of 7	1 of 7
S Skunk River @ Broad St (Story City)	324	4 of 8	1 of 8
S Skunk River @ W Riverside Rd (Ames)	339	3 of 8	2 of 8
S Skunk River @ 280th St	355	4 of 8	2 of 8
Bear Creek @ Pleasant Valley Rd	362	6 of 8	2 of 8
S Worrell Creek @ Riverside Drive (Tedesco Environmental Learning Corridor)	479	5 of 7	1 of 7
Long Dick Creek @ 567th Ave	541	7 of 8	1 of 8
Keigley Branch @ 170th St	626	5 of 7	1 of 7
Exceeds secondary contact standard (630 MPN/100mL)			
E Indian Creek @ 650th Ave	685	6 of 8	1 of 8
W Indian Creek @ Lincoln Hwy (Nevada)	886	7 of 8	2 of 8
W Indian Creek @ 280th St	1547	7 of 8	2 of 8
Not enough samples to evaluate seasonal geometric mean			
Ballard Creek @ 4th St (Cambridge)		5 of 6	1 of 6
Clear Creek @ Lee Park (Ames)		4 of 4	1 of 4
College Creek near Sheldon Ave (Ames)		4 of 4	2 of 4
Ioway Creek @ 6th St (Ames)		5 of 6	1 of 6
Worrell Creek @ S 16th St (Ames)		3 of 4	1 of 4

For secondary contact recreation, the standards are 630 MPN/100mL (geomean) and 2,880 MPN/100mL (for a single sample). All 15 streams exceeded the single sample threshold after heavy rains in June.

Bacteria in 2020-2024

Combining five years of data allows us to evaluate streams that were not flowing during dry periods and so had fewer than 7 samples in a season. College Creek, Ballard Creek, and West Indian Creek (at Jennett Heritage Area) exceeded the secondary contact recreation standard. All sites exceeded the primary contact recreation standard.

E. coli geomean (Mar-Nov, 2020-2024)
Primary contact standard (yellow), secondary contact (red)

Site	E. coli geomean
S Skunk River @ Broad St (Story City)	259
Long Dick Creek @ 567th Ave	393
Bear Creek @ Pleasant Valley Rd	271
Keigley Branch @ 170th St	458
S Skunk River @ W Riverside Rd (Ames)	132
S Skunk River @ N River Valley Park (Ames)	166
Clear Creek @ Lee Park (Ames)	587
Ioway Creek @ 6th St (Ames)	528
College Creek near Sheldon Ave (Ames)	1692
Worrell Creek @ S 16th St (Ames)	516
Ballard Creek @ 4th St (Cambridge)	743
W Indian Creek @ Lincoln Hwy (Nevada)	463
W Indian Creek @ 280th St	831
Grant Creek @ 280th St	198
E Indian Creek @ 650th Ave	332

E. coli (MPN/100mL)

Biological Monitoring, 2024

Save Our Streams program

Volunteers completed two biological surveys using the Save Our Streams protocol in 2024. Biological index scores are based on the number of groups of macroinvertebrates present and whether those groups are sensitive to pollution. Both sites had been sampled the previous year.

Site	Type	Survey Date	Sensitive Score (x 3)	Less Sensitive Score (x 2)	Tolerant Score (x 1)	Total Score
Worrelll Creek @ S. 16th St, Ames	Muddy Bottom	06/03/2024	9	8	1	18
Ioway Creek @ 6th St, Ames	Rocky Bottom	10/20/2024	6	8	0	14

Worrell Creek scored higher this year than last year (14, fair). This image shows some of the invertebrates found there.

Macroinvertebrate Score: 18

Caddisflies   Mayflies   Stoneflies   Less Sensitive Dobsonflies   Damselflies   Crayfish

Scuds   Midge Flies

Ioway Creek scored lower this year (14, fair) than last year (23, good), probably because of poor water quality. Dissolved oxygen dropped to 5 mg/L at this site in September.

Iowa DNR

The Iowa Department of Natural Resources completed biological surveys at 5 locations in Story County in 2024. An index of biological integrity is calculated based on both the number of species or taxonomic groups present, and whether sensitive or ecologically important groups are present. Complete survey results can be found on BioNet and are linked below.

- Ballard Creek at Cambridge Recreation Learning Area, July 15
  - Fish Index of Biological Integrity: 20, Poor. [10]
  - Benthic Macroinvertebrate Index of Biotic Integrity: 72, Good.[11]
- Bear Creek at Skunk River Greenbelt, Ames, July 17
  - Fish Index of Biological Integrity: 47, Fair.[12]
  - Benthic Macroinvertebrate Index of Biotic Integrity: 69, Good.[13]
- Clear Creek at Ames, June 10
  - Fish Index of Biological Integrity: 18, Poor.[14]
- South Skunk River at Osheim Prairie & Slough Preserve, September 12
  - Fish Index of Biological Integrity: 48, Fair.[15]
  - Benthic Macroinvertebrate Index of Biotic Integrity: 59, Good.[16]
- South Skunk River near Cambridge
  - Benthic Macroinvertebrate Index of Biotic Integrity: 38, Fair.[17]

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[10] https://programs.iowadnr.gov/bionet/Fish/Session/2455
[11] https://programs.iowadnr.gov/bionet/Inverts/IBI/3708
[12] https://programs.iowadnr.gov/bionet/Fish/Session/2498
[13]https://programs.iowadnr.gov/bionet/Inverts/IBI/3732
[14] https://programs.iowadnr.gov/bionet/Fish/Session/2405
[15] https://programs.iowadnr.gov/bionet/Fish/Session/2422
[16] https://programs.iowadnr.gov/bionet/Inverts/IBI/3638
[17] https://programs.iowadnr.gov/bionet/Inverts/IBI/3710