Sochacki Park Monitoring Data Summary 2021

Brian Vlach
Sr. Water Resources Manager

ThreeRivers PARK DISTRICT

Sochacki Park
Sub-watershed Assessment

- Sub-watershed Assessment conducted on improving the water quality of the wetlands in Sochacki Park.
  - Identify sources of pollutant loading
    - Watershed
    - Wetlands
  - Implement Best Management Practices (BMP) to Improve Water Quality

- Partnership Agencies
  - Golden Valley
  - Robbinsdale
  - Three Rivers Park District

  } Joint Powers Agreement

  - Bassett Creek Watershed Management Commission
  - Barr Engineering

- Objective
  - Understand the ecological health of the wetlands
  - Identify BMP's to improve ecological health of the wetlands, improve aesthetics, and provide recreation and education opportunities
  - Engage Stakeholders throughout the process

Sochacki Park Sub-watershed Assessment

Phase I

- Monitoring – 2020 & 2021
  - Watershed – Pollutant Loading Estimates
    - Automated Sampling Equipment
    - Flow & Velocity Measurements
    - Water Quality – Nutrient Concentrations (TP, SRP, TSS, & TN)
  - Wetlands
    - Water Quality – (TP, SRP, Chl-a, and Secchi Depth)
    - Aquatic Vegetation
    - Dissolve Oxygen
    - Sediment Core Analysis
    - MnRAM – Assessing wetland function & value
    - Water Levels

Phase II

- Watershed & Wetland Modeling (2022)
  - Calibrate Watershed and Wetland Model to monitoring Data
  - Identify Sources of Pollutant Loading
  - Determine realistic water quality goals for these wetlands
  - Develop recommended BMP's that would result in pollutant load reductions to improve water quality

Phase III

- Implement BMP Practices to Improve Water Quality
  - Identify those BMP practices that have a pollutant load reduction cost-benefit
  - Develop BMP implementation plan
  - Implementation of Project in the watershed and wetlands

Bassett Creek Watershed Management Commission
Barr Engineering Report
2013

- Assessment was completed on North and South Rice in 2013
  - Barr. (2013). Lake Water Quality Study Northwood Lake, North Rice Pond and South Rice Pond. Minneapolis, MN

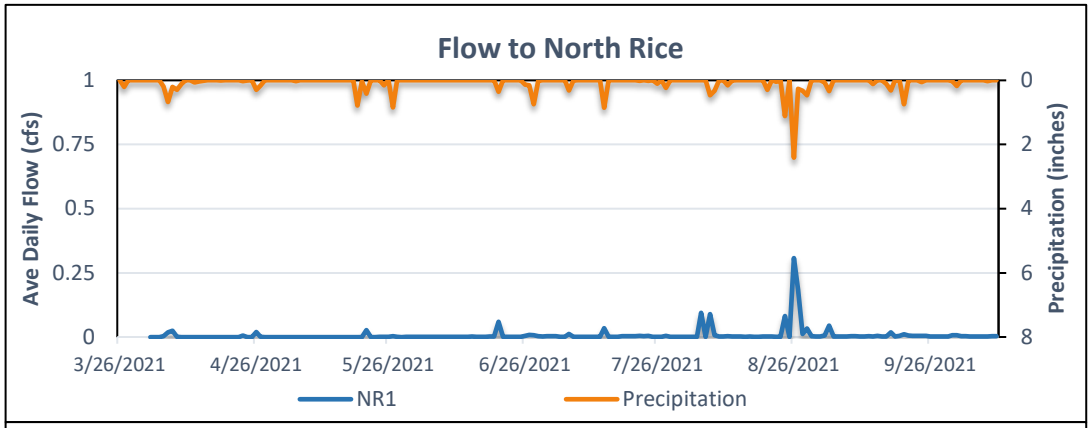
- Water quality goals for the wetlands in the report
  - Goals were set by the BCWMC
    - Total phosphorus = 75 µg/L
    - Chlorophyll-a = 40 µg/L
    - Secchi = 1 m

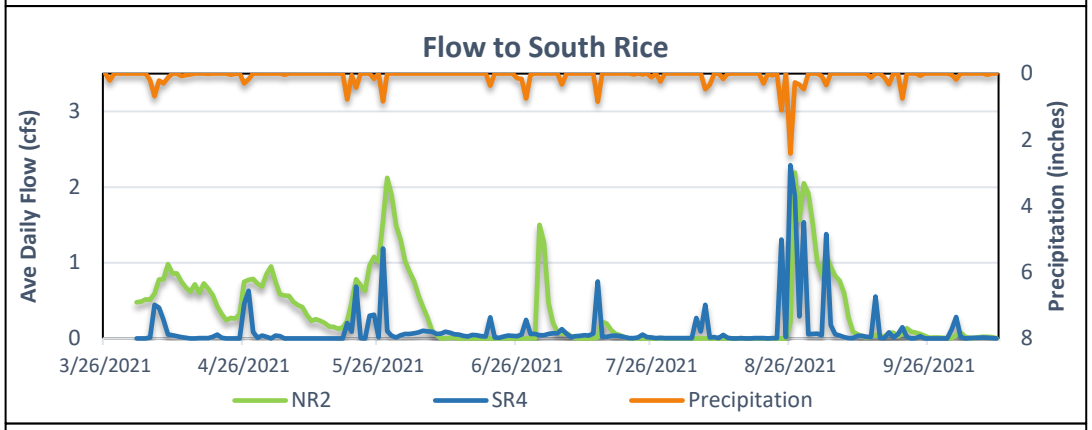
  - Since these are wetlands and not lakes, there are no state water quality standards

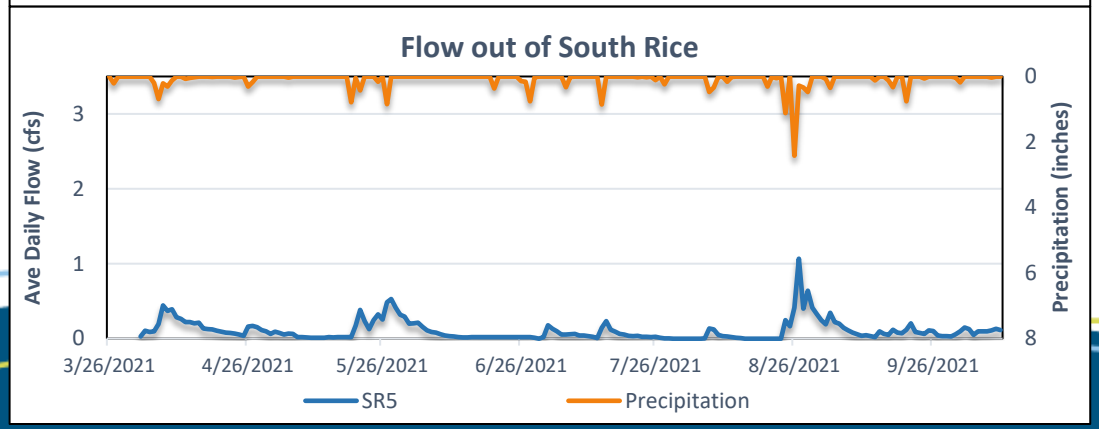
Monitoring

- 3 wetlands–water quality
  - Grimes
  - North Rice
  - South Rice
- 4 stormwater monitoring sites
- 2 sites where grab water samples were collected during storm events
- 5 sediment core locations

Sochacki Park
Precipitation and Flow 2021

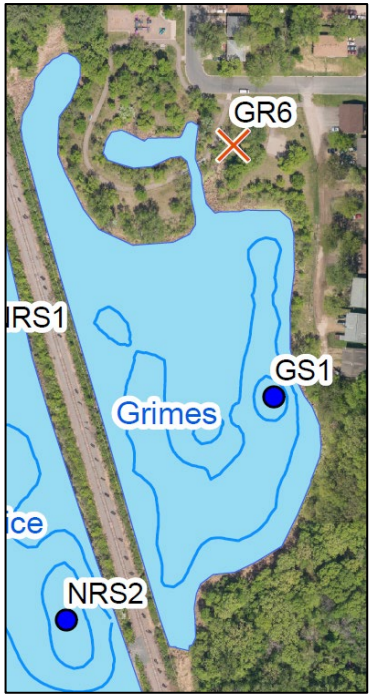






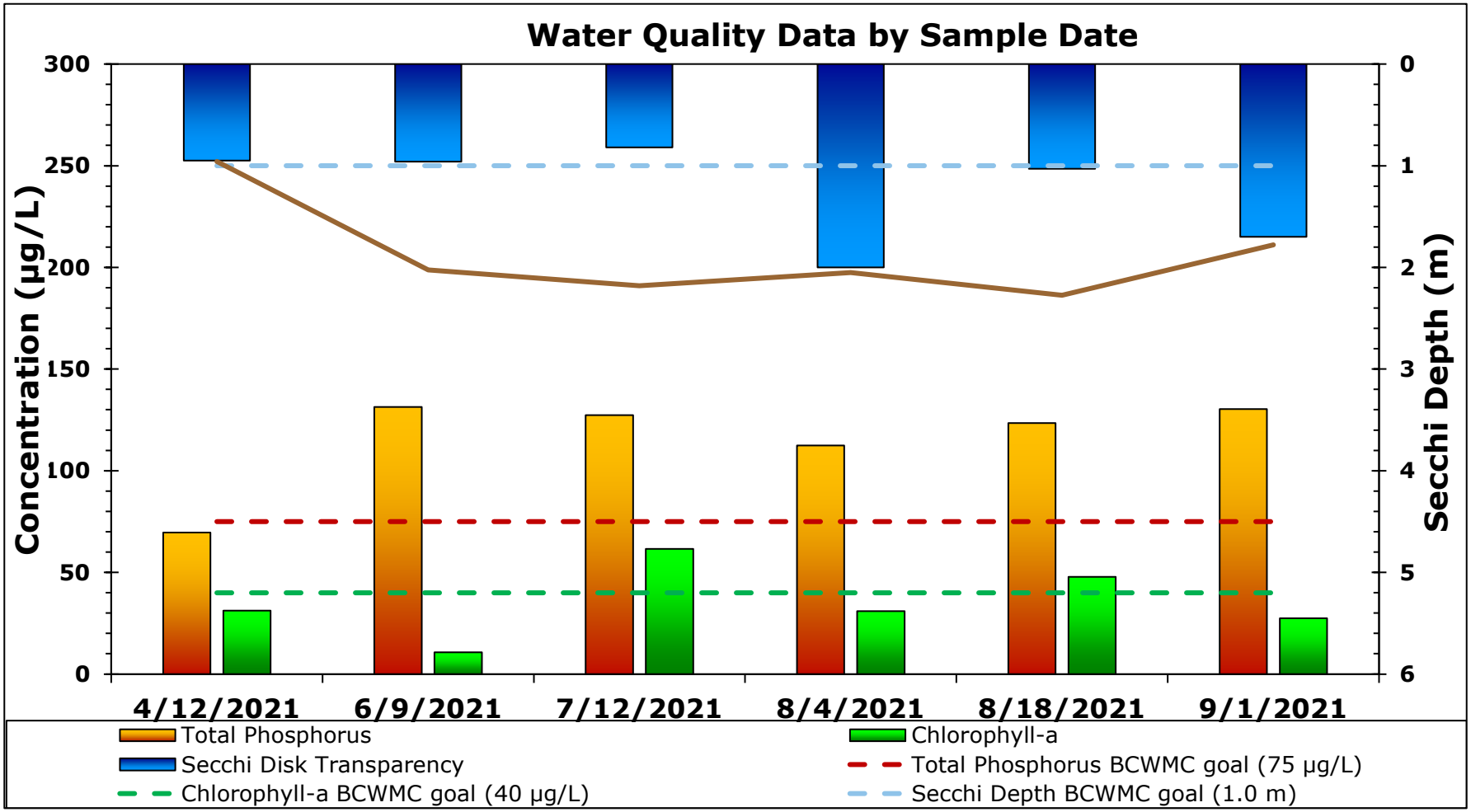
- Precipitation
  - Precipitation below average
  - 2020: 26 inches
  - 2021: 23.4 inches
  - 20-year average: 30 inches
- Notable Rain Events
  - May 24-28th – 1.0 inches
  - August 24-29th – 4.6 inches
  - Accounted for 30-50% of sampling site flow volumes
- Unfortunately, have 2 years of below average precipitation

Grimes Pond



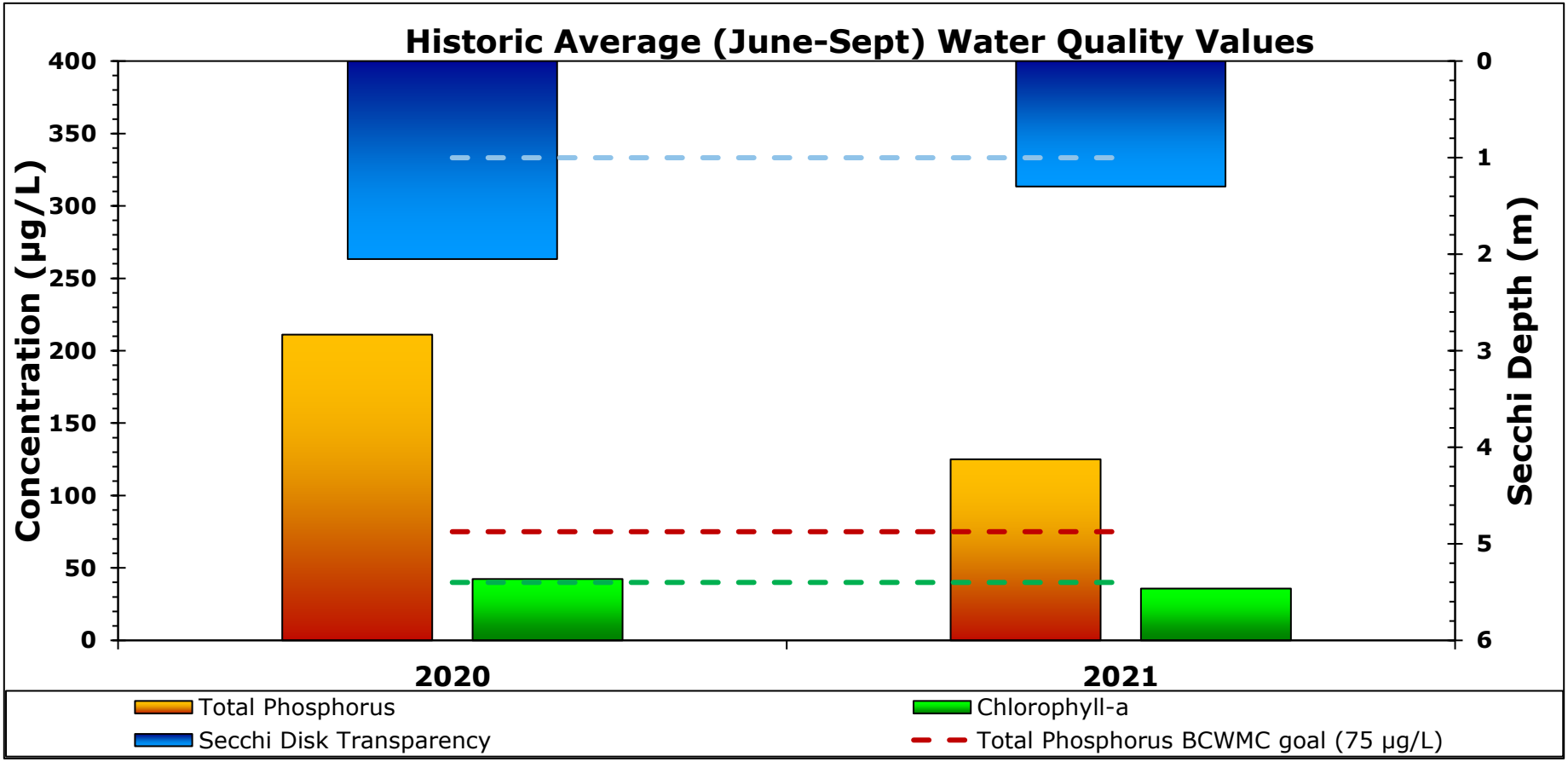
- A culvert that flows into Grimes, GR6, stormwater
  - Flow only during storm events
    - 2 grab samples collected in 2020
    - 1 grab sample collected in 2021
  - Had highest TP and TN concentrations of all stormwater sites

Grimes



- Not meeting TP goals most of season
- Meeting Chlorophyll-a goals most of season
- Close to or meeting secchi depth goals (max reading = 2.0 m)

Grimes

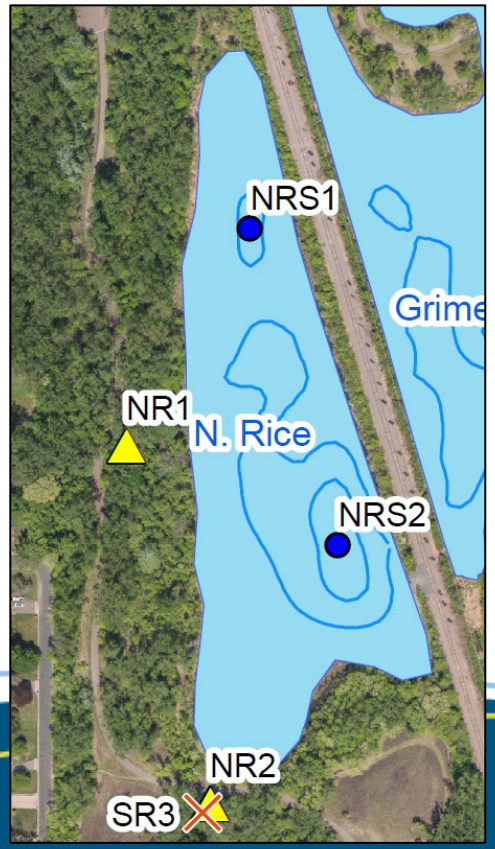


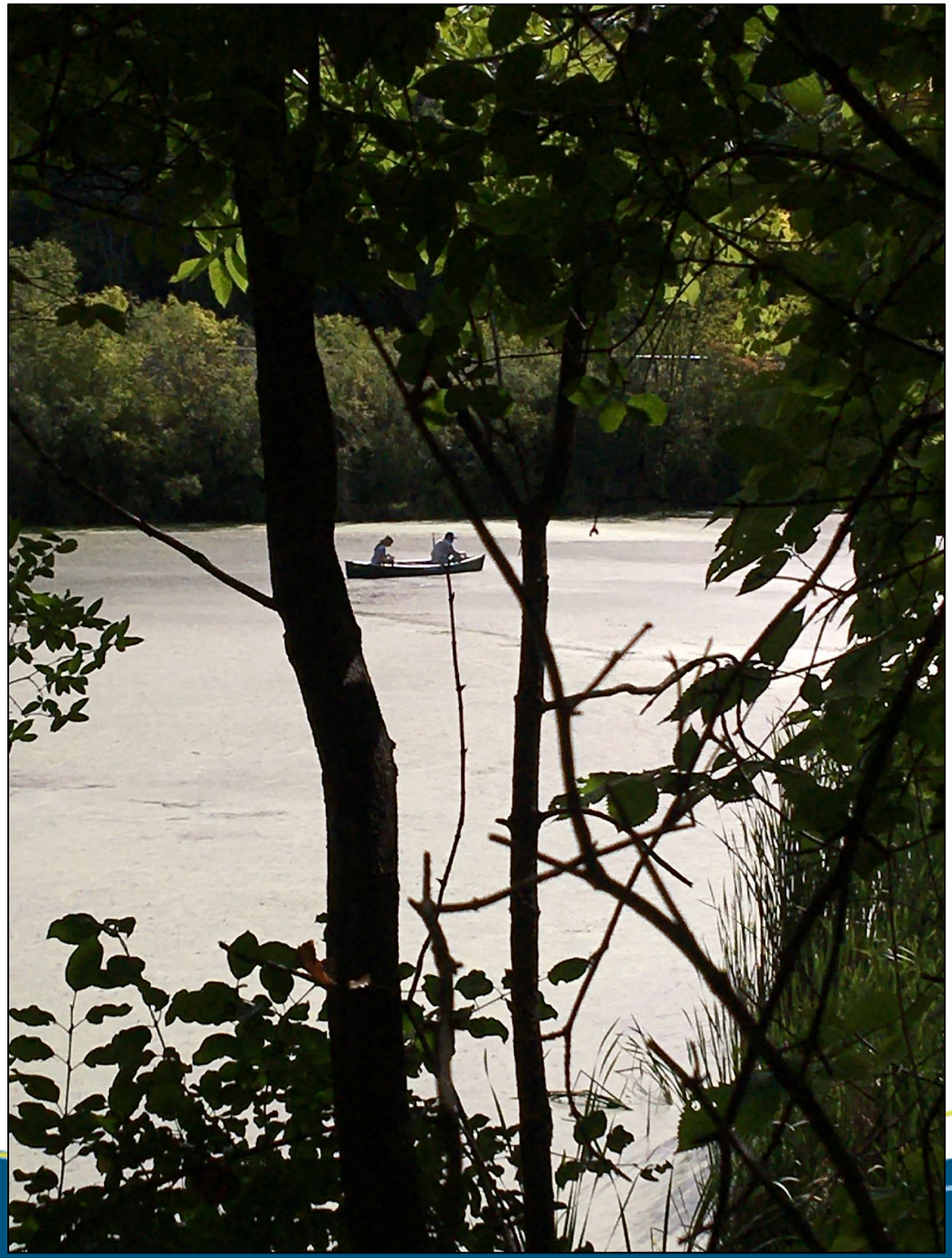
Compared to 2020

- Lower TP concentrations
- Less visibility
- Chlorophyll-a about the same

North Rice Pond

- Receives water from Grimes and NR1
  - There may be other smaller channels – but NR1 is the primary input



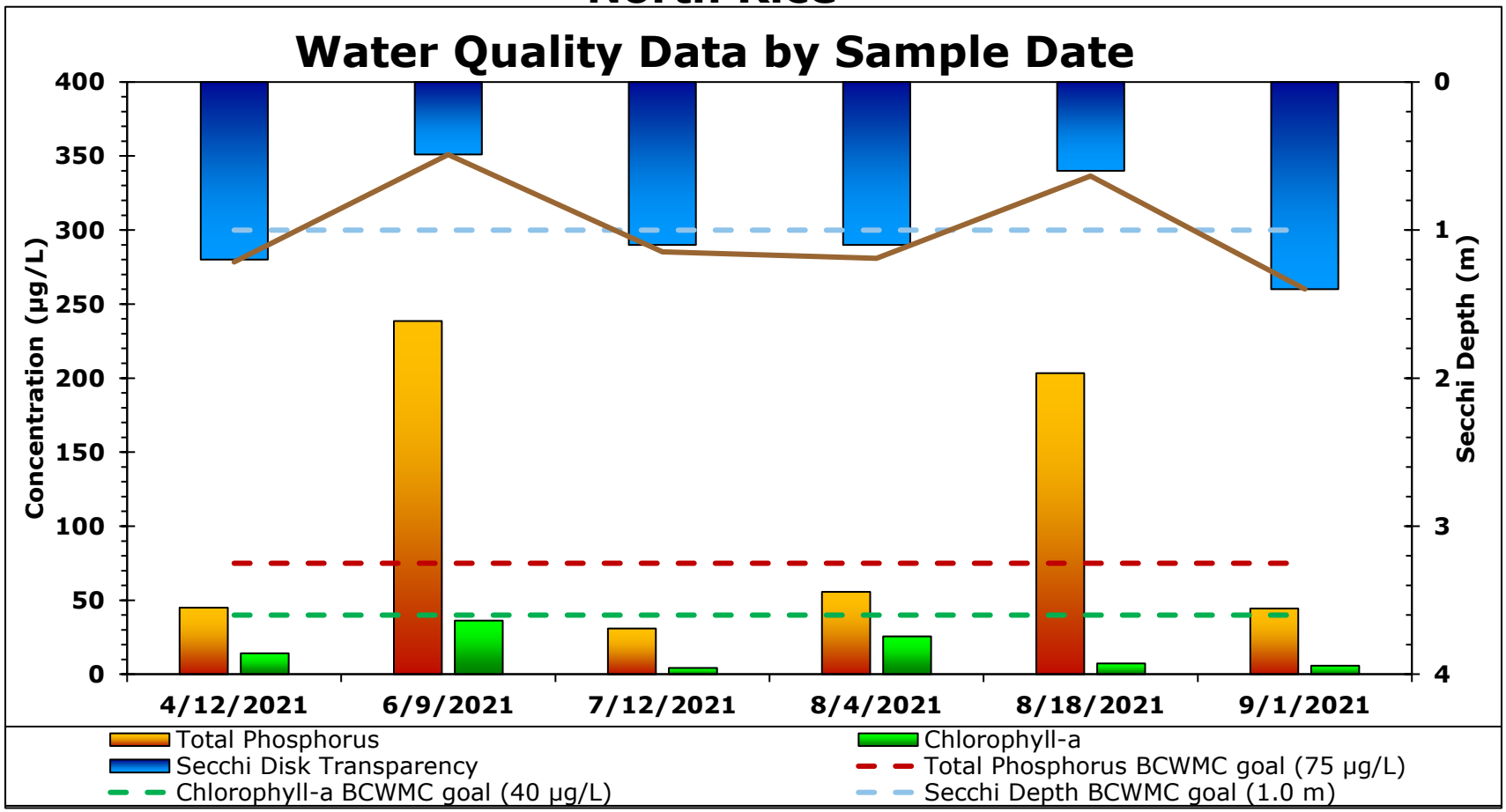


NR1 – North Rice Site 1

- Flow only during rain events
  - Sandy soils, so water infiltrates
- Very little flow into North Rice pond
  - Therefore, less loading than other sites
- Yearly loading:
  - 2021 had higher concentrations and higher loading even though a little less precipitation
  - Collected similar number of samples each year

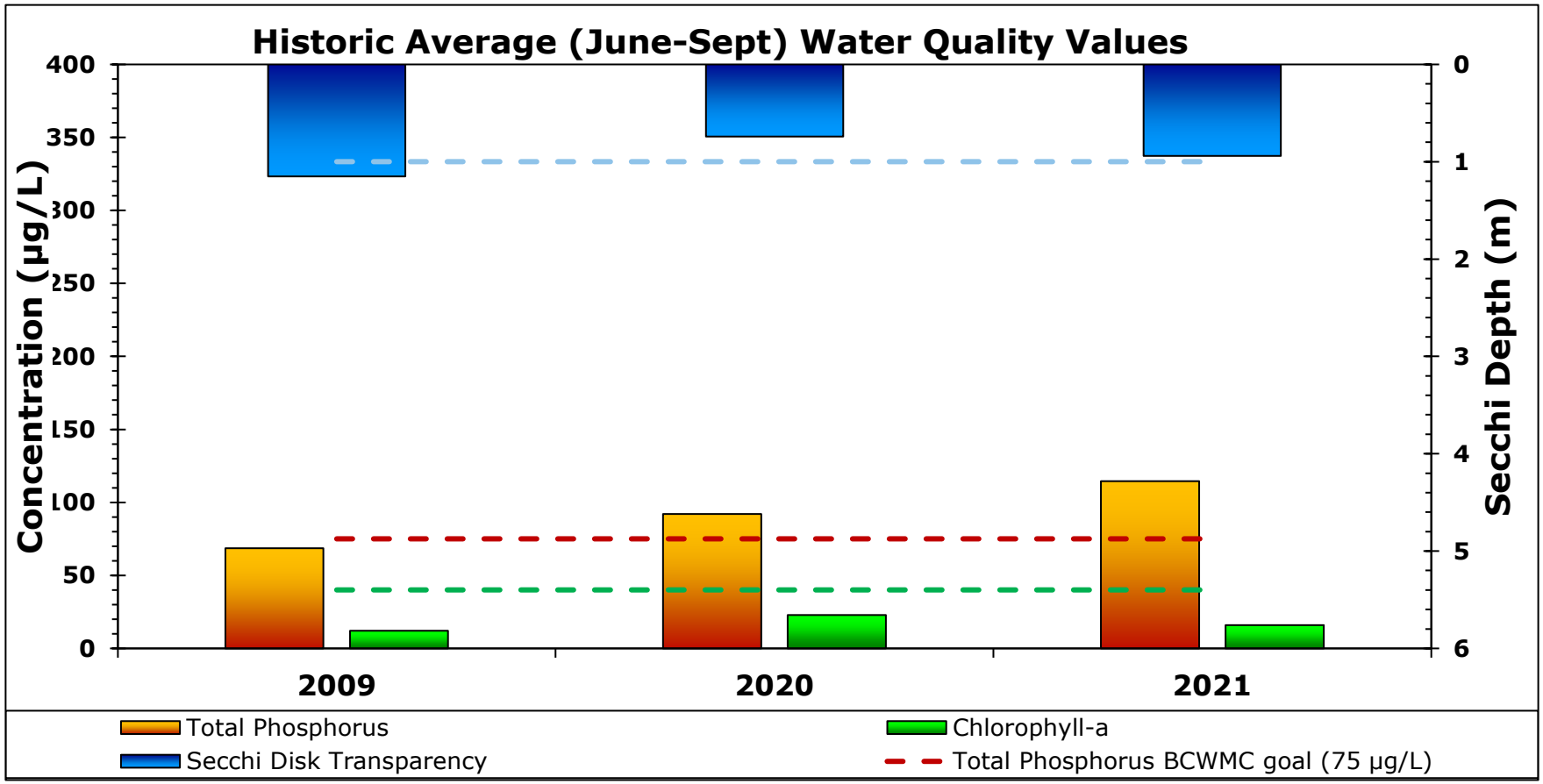
Site	Year	# of samples	Nutrient Loading					Nutrient Concentration						
			TP (lbs/yr)	SRP (lbs/yr)	TN (lbs/yr)	TSS (lbs/yr)	Cl (lbs/yr)	TP (µg/L)	SRP (µg/L)	TN (mg/L)	TSS (mg/L)	Cl (mg/L)	Flow Volume (x 106 M3)	Annual Precipitation (inches)
NR1	2020	7	2	1	12	283	0	359	195	2.09	49	0	0.003	25.88
NR1	2021	8	4	2	21	994	27	396	229	2.22	105	3	0.004	23.43

North Rice



- 2 sample events taken in more shallow areas
  - To ensure a better sample, locations with less vegetation are chosen
  - Those samples happen to have highest TP concentrations
- Meeting Chlorophyll-a goals
- Meeting secchi depth goals (max reading = 1.4 m)
  - Pond is shallow and staff could see bottom of pond at every visit.

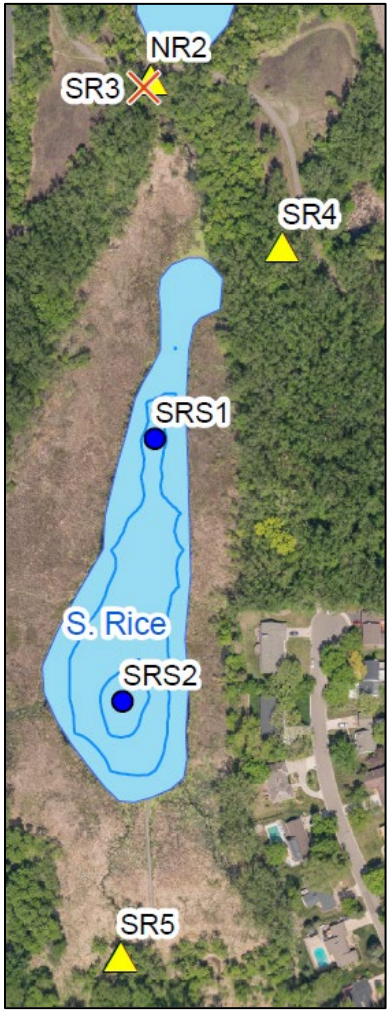
North Rice



Compared to 2020

- Higher TP concentrations
- Higher visibility
- Chlorophyll-a about the same

South Rice Pond



Receives water from

- North Rice via NR2
- SR3 –
  - a small culvert that only runs during storm events
  - Has very little flow and lower concentrations
  - 1 grab sample collected
- SR4

NR2 – North Rice outlet

- Flows out of North Rice and into South Rice
- Lowest TP, TN and TSS concentrations of the sites
  - Has highest chloride concentrations
- Highest flow of sites
- Has average nutrient loading and high chloride loading compared to other sites
- Collected similar number of samples between 2020 and 2021

Site	Year	# of samples	Nutrient Loading					Nutrient Concentration						
			TP (lbs/yr)	SRP (lbs/yr)	TN (lbs/yr)	TSS (lbs/yr)	Cl (lbs/yr)	TP (µg/L)	SRP (µg/L)	TN (mg/L)	TSS (mg/L)	Cl (mg/L)	Flow Volume (x 106 M3)	Annual Precipitation (inches)
NR2	2020	17	50	13	459	1,906	45,739	147	39	1.36	6	135	0.15	25.88
NR2	2021	13	63	36	546	2,307	92,479	119	68	1.03	4	174	0.24	23.43

SR4 – South Rice site 4

Double culvert that is dry until rain events

- Flows into South Rice
- Low flow since only during storm events
- Collected less samples in 2021 compared to 2020
  - Equipment issues, but were able to collect grabs during peak flow for 4 events
- Average nutrient loading compared to other sites

Site	Year	# of samples	Nutrient Loading					Nutrient Concentration						
			TP (lbs/yr)	SRP (lbs/yr)	TN (lbs/yr)	TSS (lbs/yr)	Cl (lbs/yr)	TP (µg/L)	SRP (µg/L)	TN (mg/L)	TSS (mg/L)	Cl (mg/L)	Flow Volume (x 106 M3)	Annual Precipitation (inches)
SR4	2020	14	30	18	213	3,933	577	279	163	1.96	36	5	0.05	25.88
SR4	2021	8	64	49	253	1,769	2,531	367	282	1.44	10	14	0.08	23.43

SR4 – South Rice site 4 – other details

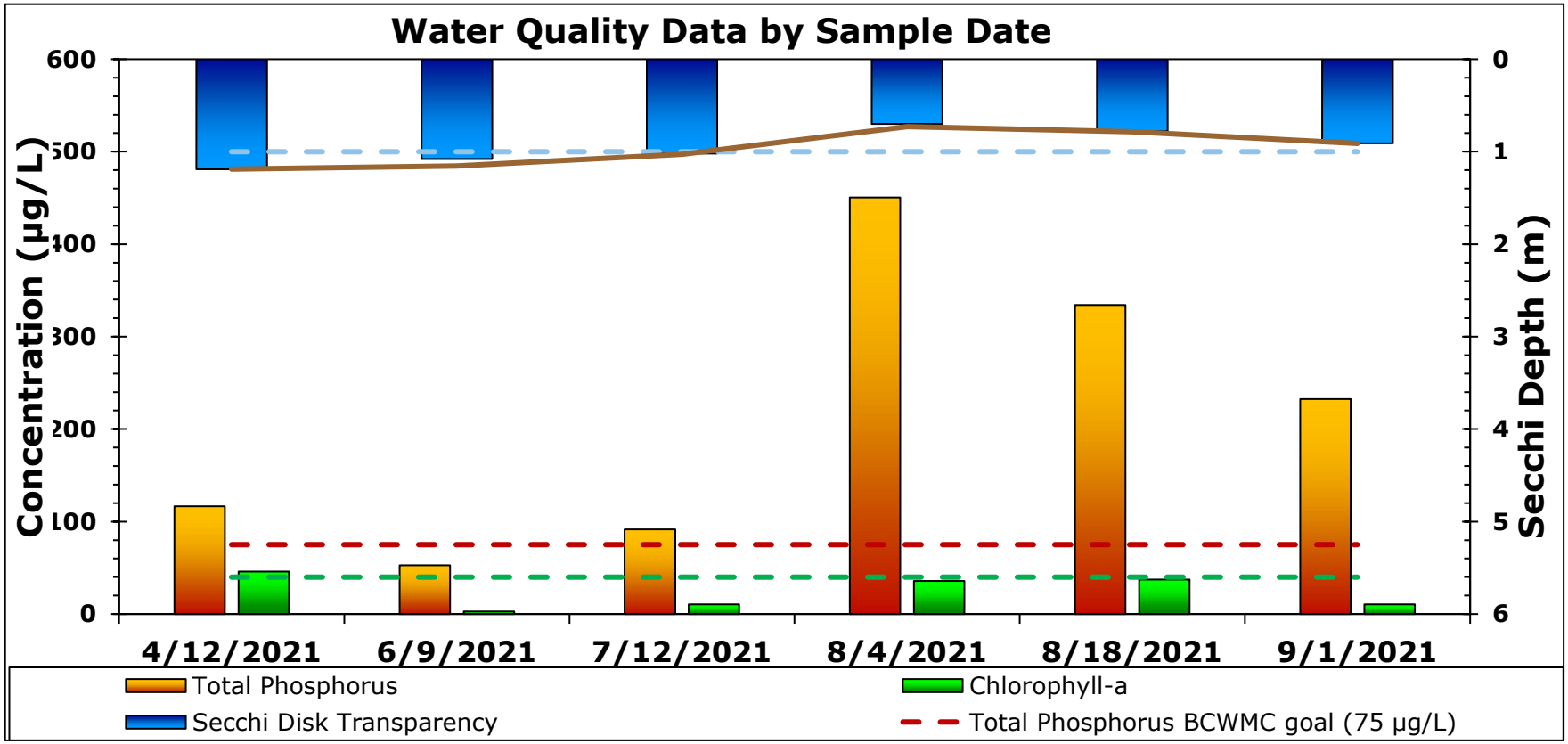
Downstream of site

- Quite a bit of concrete and building materials
- Channel is eroded due to heavy flow through this area

Upstream side of culvert

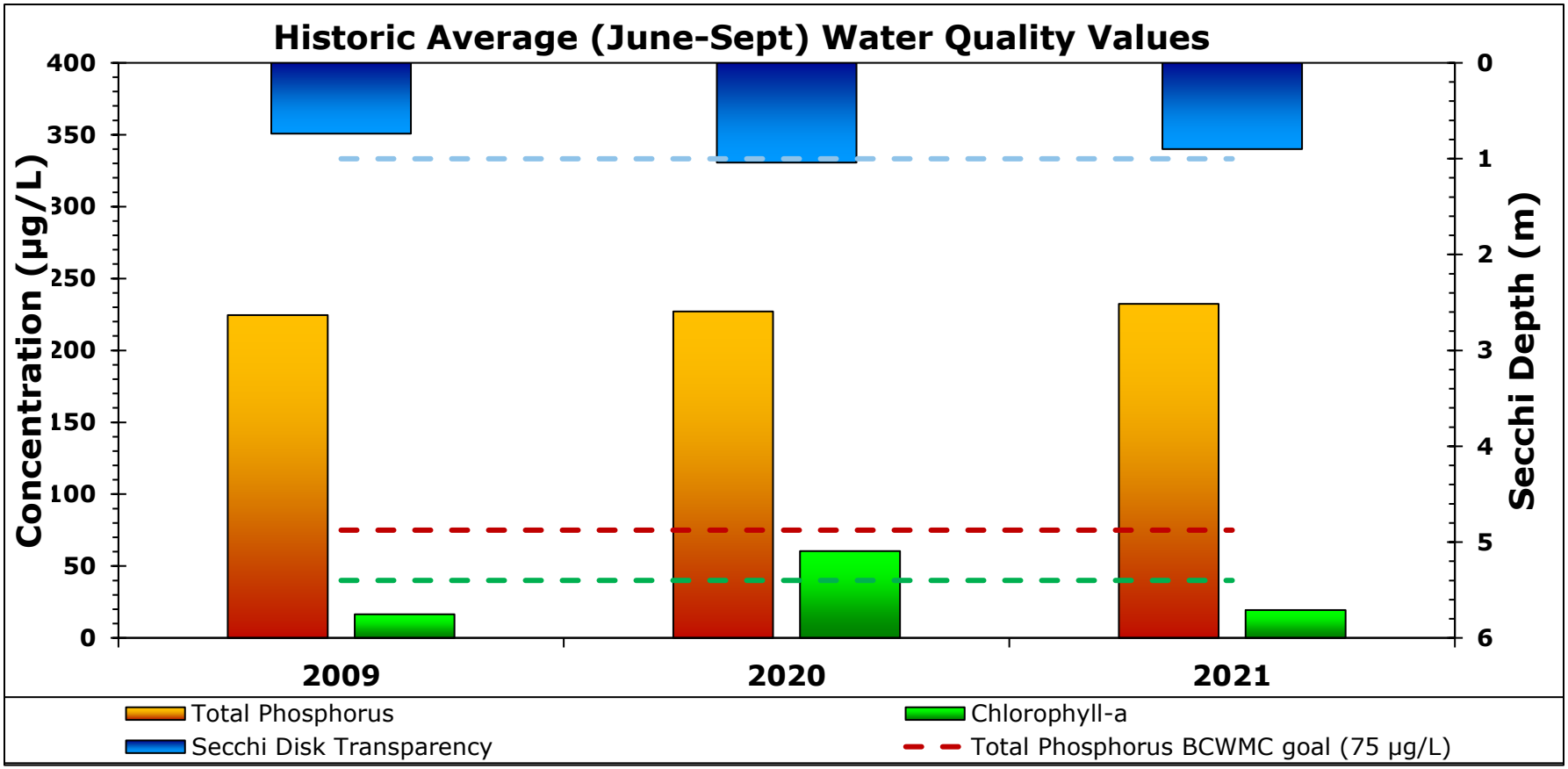
- Grates collect a lot of detritus/debris that is high in nutrients
- Cleaning this area out would allow the sediments to dry out

South Rice



- Not meeting TP goals for half of the season
- Meeting Chlorophyll-a goals
- Meeting secchi depth goals (max reading = 1.19 m)
  - Pond is shallow and staff could see bottom of pond at every visit

South Rice



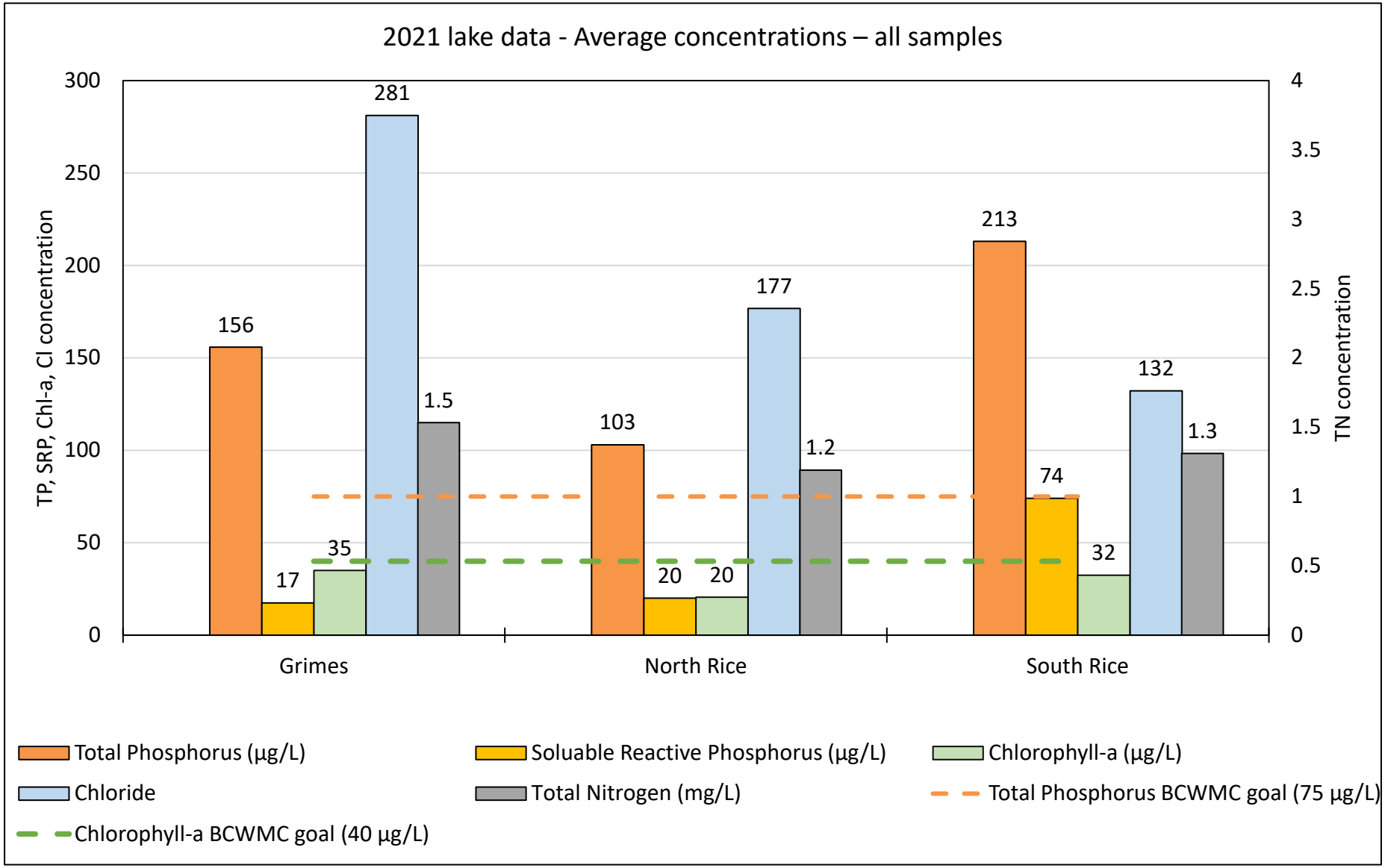
Compared to 2020

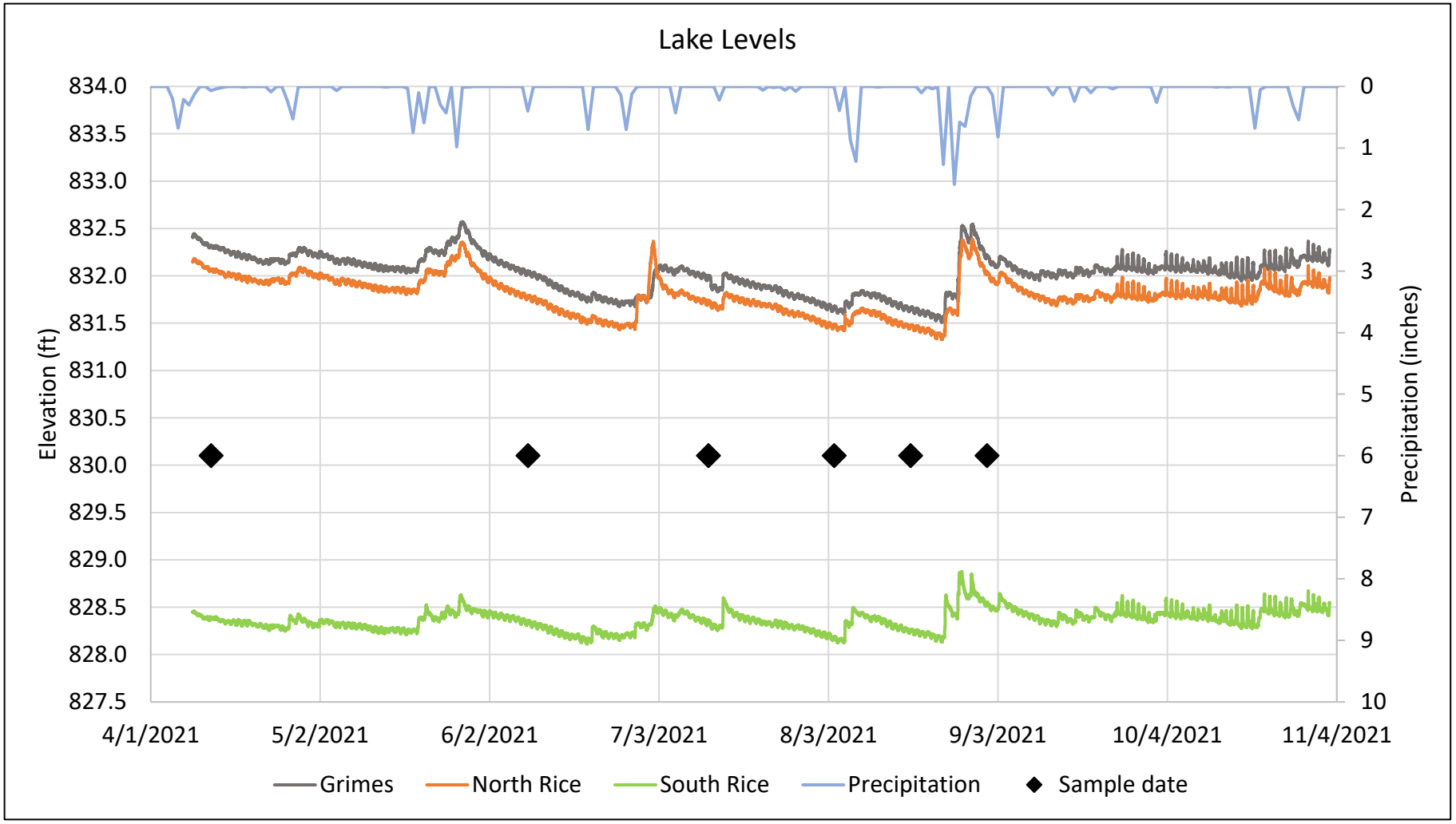
- Similar TP concentrations
- Similar visibility
- Lower Chlorophyll-a

SR5 – South Rice outlet

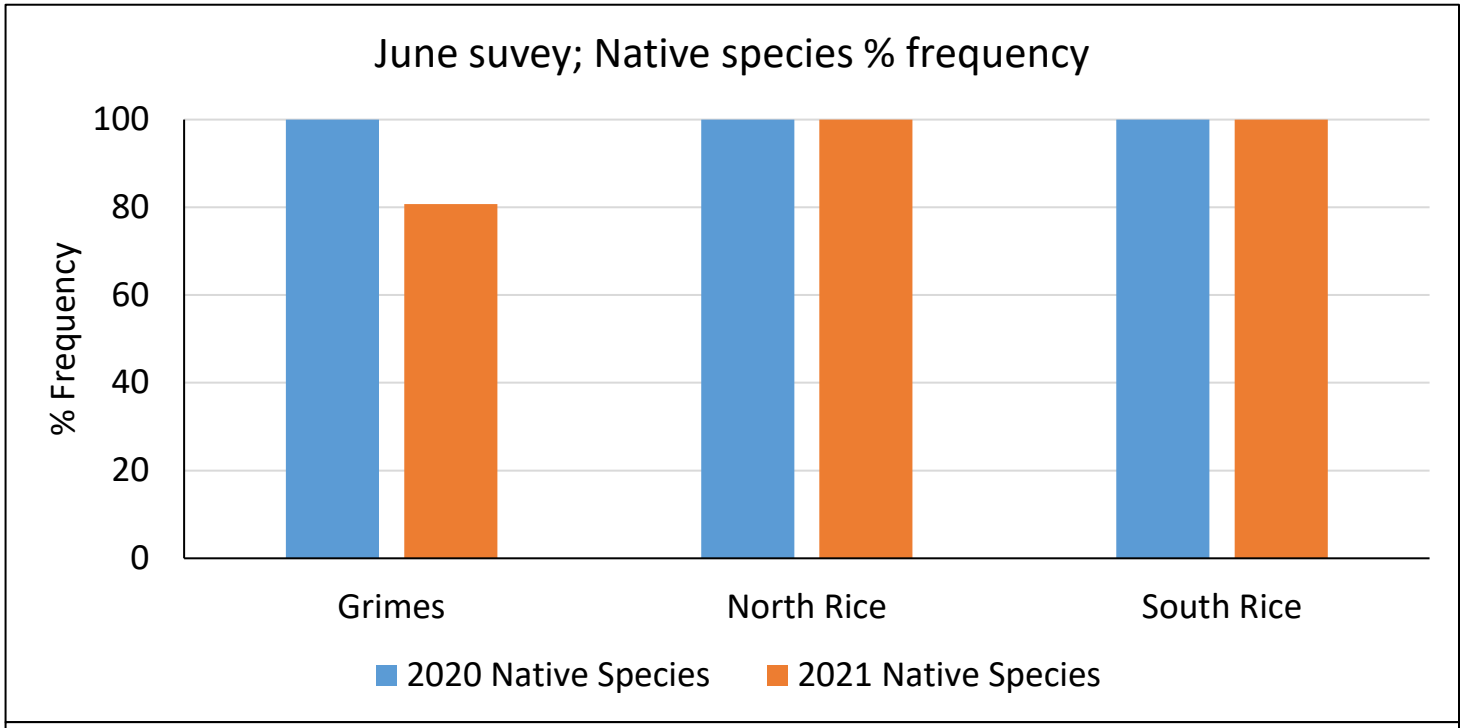
- Flows out of South Rice
  - There is a 2nd outlet channel with similar flows
- Average concentrations
- Measured flow is comparable to flow into South Rice
- Has similar loading to NR2 (outlet of North Rice) but highest TSS and Cl loading of all the sites

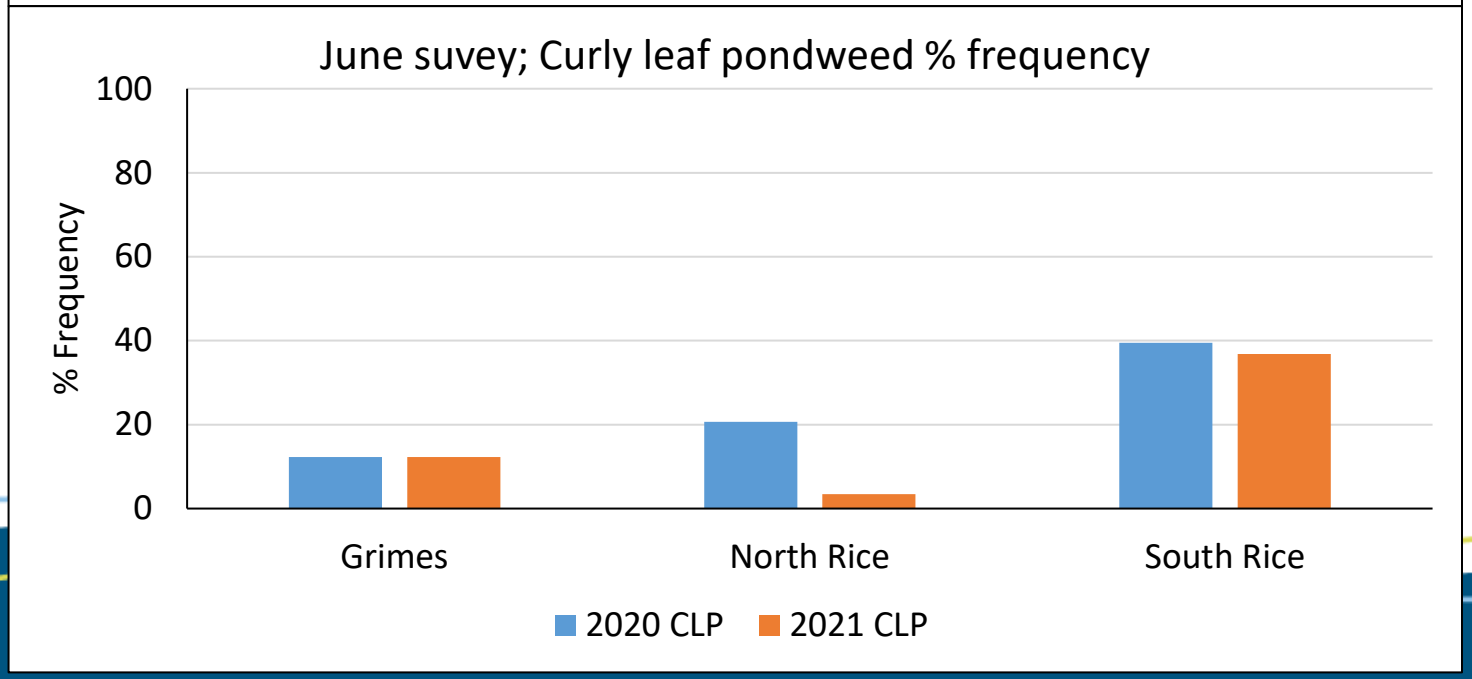
Site	Year	# of samples	Nutrient Loading					Nutrient Concentration						
			TP (lbs/yr)	SRP (lbs/yr)	TN (lbs/yr)	TSS (lbs/yr)	Cl (lbs/yr)	TP (µg/L)	SRP (µg/L)	TN (mg/L)	TSS (mg/L)	Cl (mg/L)	Flow Volume (x 106 M3)	Annual Precipitation (inches)
SR5	2020	21	74	26	526	9,343	28,703	261	94	1.86	33	102	0.13	25.88
SR5	2021	13	57	23	379	8,522	25,625	315	124	2.09	47	141	0.08	23.43


2021 lake data - Average concentrations – all samples
TP, SRP, Chl-a, Cl concentration
TN concentration
300
250
200
150
100
50
0
4
3.5
3
2.5
2
1.5
1
0.5
0
156
17
35
281
1.5
103
20
20
177
1.2
213
74
32
132
1.3
Grimes
North Rice
South Rice
Total Phosphorus (µg/L)
Soluable Reactive Phosphorus (µg/L)
Chlorophyll-a (µg/L)
Chloride
Total Nitrogen (mg/L)
Total Phosphorus BCWMC goal (75 µg/L)
Chlorophyll-a BCWMC goal (40 µg/L)



Elevation	Grimes	North Rice	South Rice
Max	832.57	832.38	828.88
Min	831.51	831.33	828.11
Ave	832.03	831.80	828.36
Change in elevation (ft)	**1.06**	**1.06**	**0.77**


June suvey; Native species % frequency
100
80
60
40
20
0
% Frequency
Grimes
North Rice
South Rice
2020 Native Species
2021 Native Species


June suvey; Curly leaf pondweed % frequency
100
80
60
40
20
0
% Frequency
Grimes
North Rice
South Rice
2020 CLP
2021 CLP

Vegetation surveys 2020	% Frequency of Occurance					
	6/17/2020			8/26/2020		
	Grimes	North Rice	South Rice	Grimes	North Rice	South Rice
Ceratophyllum demersum (Coontail)	98	97	92	100	100	89
Potamogeton crispus (Culy-leaf Pondweed)	12	21	39			
Elodea canadensis (Elodea)			47			
Potamogeton spp (Narrow Pondweed spp)	28	45	68	9	14	5
Stuckenia pectinata (Sago Pondweed)	11	17		4	7	
Chara spp (Chara)	2					
Lemna trisulca (Star Duckweed)	30	48		16	80	
Lemna minor (Small Duckweed)	84	83	100	100	100	82
Spirodela polyrhiza (Greater Duckweed)	87	65	100	51	100	82
Wolffia columbiana (Watermeal)	96	89	100	100	100	89

Vegetation surveys 2021	% Frequency of Occurance					
	6/24/2021			9/1/2021		
	Grimes	North Rice	South Rice	Grimes	North Rice	South Rice
Ceratophyllum demersum (Coontail)	96	93	87	100	100	90
Potamogeton crispus (Culy-leaf Pondweed)	12	3	37			
Elodea canadensis (Elodea)			68			53
Potamogeton spp (Narrow Pondweed spp)	42	41	79	7		10
Stuckenia pectinata (Sago Pondweed)	9	10		2	3	
Chara spp (Chara)				2		
Lemna trisulca (Star Duckweed)	33	65		39	65	13
Lemna minor (Small Duckweed)	100	100	100	98	100	98
Spirodela polyrhiza (Greater Duckweed)	100	100	100	100	100	98
Wolffia columbiana (Watermeal)	100	100	100	100	100	98

Other monitoring

- Dissolved oxygen
  - April and June had higher levels, but rest of season was anoxic at all ponds
  - Due to low oxygen levels, bacteria do not efficiently break down decaying material
- Vegetation
  - Thick Coontail
  - Lots of duckweeds & watermeal
  - 2013 study noted that Curly-leaf pondweed (CLP) was only found in South Rice
    - CLP was found in all 3 ponds in the spring but not in fall due to normal die off
- Sediment Cores
  - Collected in January 2021
  - Awaiting results to see influence of sediment phosphorus on water quality

Sochacki Park
Sub-watershed Assessment
Next Steps

Phase I

- Monitoring Efforts – 2020/2021
- Process and Summarize Monitoring Data –2020/2021
- MnRAM Wetland Function & Value Analysis – Fall/Winter 2021
- Stakeholder Engagement – Ongoing 2020/2021/2022

Phase II

- Modeling of Watershed – January/February 2022
- Modeling of Wetlands – March/April 2022
- Modeling Simulations to evaluate potential watershed BMPs and wetland management options – May 2022
- Sochacki Park Sub-watershed Assessment Report – June 2022
  - Phosphorus Load reductions necessary to achieve water quality goals
  - Cost-benefit analysis
  - Implementation Plan