



STREAM MANAGEMENT PLAN – Page 1

Stream name Little Net River			Kittle Number S-000.7-002-001		Total Miles in Minn. 12.04		Date of Plan (Mo.-Yr.) 5-2022	
Region 2	Area Fisheries Office Duluth Area- F213		Plan Managed Segment (river miles) 0 – 12.04			Length (miles) Plan Managed Segment 12.04		
Major Watershed: Nemadji River (5)			Minor Watersheds (significant tributaries) Little Net River (5020)					
Similar Reach	Similar Reach Name	Stream Miles		Length miles	Rosgen Channel Type	Fisheries Ecological Classification ¹		Species of Management Interest
1	Anadromous	0.0 – 1.5		1.5	unknown	coldwater		Brook Trout, Brown Trout
2	Brook Trout	1.5-5.5		4	unknown	coldwater		Brook Trout
3	Marginal Trout	5.5 – 10.0		4.5	unknown	coldwater		Brook Trout
4	Headwaters	10.0-12.04		2.04	unknown	warmwater		none

Long Range Goals

Goal 1: Provide a trout fishery by establishing a naturally reproducing Brook Trout population in reach 2, and maintaining naturally reproducing trout populations in Reach 1 including Brook Trout and occasional anadromous Brown and Rainbow Trout.

Objectives (Desired Future Conditions) and Operational Plans:

- 1) Introduce Brook Trout into similar reach 2 by stocking 3000 wild strain fingerlings (adipose clipped) annually for three consecutive years beginning in 2023, or as soon as stock are available.
- 2) Conduct population assessments in 2025 and 2028 (or 3rd stocking year and 3 years post stocking) to determine if stocking has resulted in a Brook Trout population that is reproducing.
- 3) Conduct population assessments as needed after 2028 to monitor trout populations and impact of management actions.



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Goal 2: Increase the connectivity and resiliency of the Little Net River.

Objectives (Desired Future Conditions) and Operational Plans:

- 1) Work with partners replace crossings with structures that provide for sediment and aquatic organism passage.
- 2) Minimize impacts to aquatic resources by providing recommendations during permit review and forest harvest planning.
- 3) Minimize impacts of climate change by following Operational Order 131.
- 4) Request signage by Parks and Trails division where illegal vehicle use is identified in the streambed.

Area Specific needs
■ 1854 Ceded Territory
■ Designated Trout Stream

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Approvals

Plan Authors			
Deserae Hendrickson			
Area Supervisor	Date	Regional Manager	Date



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BACKGROUND INFORMATION

Priorities- Little Net River is a high management priority because it is a designated trout stream with significant angler access, public land along a significant reach of the stream, and favorable water temperature profiles and trout habitat within the lower stream reaches.

Description of Stream System- Little Net River originates in the peat meadows on top of the high Nickerson glacial moraine. Here it is a small and sluggish stream, black with organic matter, soft-bottomed and too warm for trout. Near Holyoke it falls rapidly 200 feet in elevation down the slopes of the old Glacial Lake Duluth. As it falls over the sandstone ledges it carves deep pockets with its cascades. Picking up cold spring water the stream becomes clearer and cooler in the lower reaches. Farther downstream the Little Net reaches lake-deposited red clay where it has cut sharply into the ancient lake deposits carving steep-sided gorges more than 100 feet deep. It has a gradient of 34 feet/mile in the warmwater/marginal reach, 41 feet/mile in the Brook Trout reach, and 88 feet/mile in the anadromous reach.

Past Surveys and Investigations-

Full Surveys – None.

Population Assessments – 1985, 1990, 2019, 2020

Temperature Assessments – 2002, 2003, 2004

Past Management- The Little Net River was initially designated as a trout stream in 1944. Brown Trout yearlings were stocked in 21 years between 1955 and 1976. Rainbow Trout fry were stocked in odd years between 1985 and 1991 for a total of four stocking events (Table 1). The posted boundary delineating different angling regulations is at County Road 8.

ASSESSMENT OF RESOURCE CONDITION

HYDROLOGY

General Description- Land usage within the watershed is 59% forestland, 35% wetland, 2% pasture and hay, 1% urban development, and less than 1% water.

Precipitation trends within the Nemadji watershed have been compared for the last 30 years (1989-2018) with the long term climate record (1895-2018) in the Watershed Health Assessment Framework (MNDNR). Annual precipitation is increasing, with the majority of increased precipitation occurring in summer and fall (Figure 1). Statewide, both 10 year and 100 year precipitation events have increased in recent decades (state climatology office, personal communication).



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Management Concerns for Hydrology (at each of three spatial scales)

Watershed scale Concerns- Increasing precipitation observed under climate change has a high capacity to increase frequency and magnitude of flood peaks, with more frequent large storm events. This has the potential to destabilize the stream channel. Maintaining the high proportion of forested land and wetland within the watershed is key to reducing the impact of hydrologic changes.

Riparian scale Concerns- None.

Instream scale Concerns- None.

Management Recommendations for Hydrology:

- 1) Continue to review forest harvest within the watershed and provide input on potential for stream impact.

CONNECTIVITY

General Description- There are a number of natural falls of varying height downstream of CSAH 8 that limit trout movement upstream. Analysis of leaf-off imagery identified a total of ten stream crossings (Table 2). Only two crossings are still fish barriers. The road crossing at CSAH 8 is currently likely a partial barrier at some flows, although fish passage conditions were improved dramatically when the structure was replaced in 2016 with a bottomless structure placed on the natural bedrock feature at this site. The one remaining fish barrier culvert on Harlis Road is due to be replaced in 2023.

Management Concerns for Connectivity (at each of three spatial scales)

Watershed scale Concerns- Cumulative impacts of road and trail crossings may affect longitudinal and lateral connectivity.

Riparian scale Concerns- None

Instream scale Concerns- Poorly designed road and trail crossings can be either permanent barriers to fish movement or partial barriers to fish movement and interrupt natural sediment transport processes.

Management Recommendations for Connectivity:

- 1) Work with partners to ensure that future replacement of road and trail crossings are properly sized and placed to allow for aquatic organism passage and stream function.

GEOMORPHOLOGY AND FISH HABITAT

General Description- A full survey of the Little Net River has never been completed, so detailed substrate and habitat data are lacking. Observations by field crews during electrofishing surveys have identified the following habitats by similar reach:



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Reach 1- Contains many ledge rock waterfalls and a good quantity of deep pool habitat, appears likely to be mostly in the Rosgen B channel type.

Reach 2- Appears to be a transition zone with mixed Rosgen B/C channel type, with more riffle than pool habitat. Substrates are mostly gravel, boulder or cobble, and pools tended to be shallower in this reach.

Reach 3- Primarily Rosgen C channel type with sand as the primary substrate and some boulder/cobble/gravel in riffles. This reach contains lots of good pool habitat.

Reach 4- A mix of Rosgen E and C channel. Riparian areas in this reach are either open former beaver meadow or channel is completely shaded by tag alder.

Management Concerns for Geomorphology and Fish Habitat (at each of three spatial scales)

Watershed scale Concerns- Similar to other streams in the area, historic logging after settlement likely destabilized the stream channel with increased runoff, resulting in channel downcutting and isolation from the larger historic floodplain.

Riparian scale Concerns- All of the road and trail crossings may impact the stream, causing erosion and altering stream geomorphology if not sized properly.

Instream scale Concerns- ATV crossings, except where bridged, have the potential to degrade habitat and cause erosion in some areas and aggradation of sediments in other areas that could negatively impact fish habitat.

Management Recommendations for Geomorphology and Fish Habitat:

- 1) Encourage best management practices for reducing sediment inputs at road and trail crossings.

WATER QUALITY

General Description- Water temperatures from 2002-2004 indicate that the thermal regime of Little Net River in the lower reaches is excellent for Brook Trout. However, upper reaches of the stream appear unsuitable much of the time to support trout and may be suitable for seasonal use only (Table 3). The mean percentage of time water temperatures were within the range of thermal stress for Brook Trout was 6% in the lower stream reach and 24% halfway up the streams length (Table 4). Though Brook Trout experience reduced growth and potential mortality during thermally stressful periods, the percentage of time Little Net River exhibits these temperatures in its lower reaches is well within acceptable ranges for Brook Trout, and water temperatures did not exceed lethal levels here. Halfway up the stream, water temperature conditions were much different, with long periods in the stressful range, and a significant number of lethal readings (Table 4, Figure 2).



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As of 2022, there were no stream impairments identified by the Minnesota Pollution Control Agency.

Management Concerns for Water Quality (at each of three spatial scales)

Watershed scale Concerns- The high percent of forested land in the Little Net watershed is protective of the stream provided forest harvest within the watershed is spread out over time.

Riparian scale Concerns- Many trails for motorized recreation run adjacent to the creek, with significant potential for erosion of sediment into the stream. The large number of stream crossings for trails and road could lead to additional sedimentation to the stream if not managed well.

Instream scale Concerns- Repeated road crossing washouts in recent larger rain events have contributed large amounts of sediment entering the stream channel in the last 20 years. This has been most common at the Harlis and Bley Road crossings, both of which will have been replaced by 2023. However, the excess sediment inputs may affect channel stability for some time.

Management Recommendations for Water Quality:

- 1) Work with partners to monitor for and minimize erosion from trails and road crossings into the stream.

BIOLOGY

General Description- Electrofishing has occurred at six stations between 1985 and 2020 by MN DNR and MN PCA combined (Figure 3). A total of 17 fish species have been sampled, including Brook Trout, Brown Trout and Rainbow Trout (Table 4). A significant number of Largemouth bass were also sampled below the barrier falls in 2020.

The natural waterfalls below CSAH 8 appear to be full barriers to fish movement, as no trout other than stocked juvenile Rainbow Trout have been found above it in assessments (Table 5). In more recent assessments, naturally reproduced Brook Trout were present below the falls, including both juveniles and adults, and one adult Brown Trout was also captured. Based on the most recent assessment without the influence of stocking, it does not appear that this stream is utilized for spawning by anadromous Rainbow Trout.

The lack of trout in reaches immediately above CSAH 8 and the barrier waterfall appears to be due to its inaccessibility rather than poor habitat or temperature conditions.

Management Concerns for Biology (at each of three spatial scales)

Watershed scale Concerns- None.

Riparian scale Concerns- None.

Instream scale Concerns- A significant reach of excellent trout habitat is not being utilized due to natural fish



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barriers.

Management Recommendations for Biology:

- 1) Introduce Brook Trout into similar reach 2 by stocking 3000 wild strain fingerlings (adipose clipped) annually for three consecutive years beginning in 2023, or as soon as stock are available.
- 2) Conduct population assessments in 2025 and 2028 (or 3rd stocking year and 3 years post stocking) to determine if stocking has resulted in a Brook Trout population that is reproducing.
- 3) Conduct population assessments as needed after 2028 to monitor trout populations and impact of management actions.

SOCIAL ASPECTS

General Description-

Angling pressure on Little Net River is unknown. The posted boundary is located at the CSAH 8 crossing, 1.5 miles from the mouth. Downstream of this boundary anglers must follow regulations for Lake Superior tributaries below posted boundaries. Upstream of this boundary anglers must follow the regulations for Lake Superior tributaries above posted boundaries.

Land ownership adjacent to the river is 76% public, with most public land under DNR Forestry management.

There are many recreational opportunities in the Little Net watershed, with many off-road vehicle trails that cross the stream. Some of this use could cause habitat degradation via trail erosion entering the stream.

Climate change has the potential to affect fish populations in Little Net River. A changing climate can alter fish behavior, distribution, development, reproduction and survival. Because the rate and magnitude of climate change may exceed the adaptive capacity of fish species, active (adaptive) management is required to increase resilience and reduce the impacts of climate change. Appendix A of the MNDNR Operational Order 131 was consulted to characterize potential climate effects on aquatic resources in Little Net River. The primary adaptation strategy for climate change will be to maintain a resilient and healthy watershed. Protecting important features such as riparian wetlands, floodplains, terraces, sediment transfer areas, water storage areas, nutrient cycling capabilities, natural hydrologic regimes, significant forest cover (>50%) in the watershed, and riparian corridors will help maintain system resiliency to climate change.

A draft of this plan was made available for public review from February 15 through March 15. Comments solicited via news release were accepted for consideration. XX comments were received.

Management Concerns for Social Aspects (at each of three spatial scales)

Watershed scale Concerns- Climate and landscape changes in the Little Net watershed have the potential to negatively impact all aspects of stream health.



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Riparian scale Concerns- Erosion from off road vehicle trails along Little Net River and trail crossings have the potential to increase sedimentation.

Instream scale Concerns- Continued education of riders to prevent off-road vehicle use within the stream bed is recommended.

Management Recommendations for Social Aspects:

- 1) Minimize impacts to aquatic resources by providing recommendations during permit review.
- 2) Minimize impacts of climate change by following Operational Order 131.
- 3) Request signage by Parks and Trails division where illegal vehicle use is identified in the streambed.

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Table 1. Stocking history in Little Net River (S-000.7-002-001).

Year stocked	Year class	Species	Size	Number	Location stocked
1955	1954	Brown Trout	Yearling	700	unknown
1956	1955	Brown Trout	Yearling	682	unknown
1957	1956	Brown Trout	Yearling	851	unknown
1958	1957	Brown Trout	Yearling	500	unknown
1959	1958	Brown Trout	Yearling	520	unknown
1960	1959	Brown Trout	Yearling	275	unknown
1961	1960	Brown Trout	Yearling	1381	unknown
1962	1961	Brown Trout	Yearling	691	unknown
1963	1962	Brown Trout	Yearling	700	unknown
1964	1963	Brown Trout	Yearling	352	unknown
1965	1964	Brown Trout	Yearling	697	unknown
1966	1965	Brown Trout	Yearling	707	unknown
1967	1966	Brown Trout	Yearling	750	unknown
1968	1967	Brown Trout	Yearling	627	unknown
1969	1968	Brown Trout	Yearling	1,008	unknown
1970	1969	Brown Trout	Yearling	702	unknown
1971	1970	Brown Trout	Yearling	700	unknown
1972	1971	Brown Trout	Yearling	700	unknown
1973	1972	Brown Trout	Yearling	679	unknown
1974	1973	Brown Trout	Yearling	570	unknown
1976	1975	Brown Trout	Yearling	600	unknown
1985	1985	Rainbow Trout	Fry	33,375	CSAH 8
1987	1987	Rainbow Trout	Fry	50,000	CSAH 8 and CR 145
1989	1989	Rainbow Trout	Fry	67,957	CSAH 8 and CR 145
1991	1991	Rainbow Trout	Fry	34,864	CSAH 8, Bley Rd, and State Forest Road

Table 2. Stream crossings of the Little Net River (S-000.7-002-001) and their fish passage status as of 2021.

Description	Stream Mile	Crossing Type	UTM Easting	UTM Northing	Fish Barrier?
CSAH 8	1.5	Bottomless Arch	549059	5147882	Yes or Partial
Railroad	2.2	Bridge	549322	5147162	No
Bley Road	5.8	Bridge	549704	5143845	No
State Forest Trail Crossing 1 off Bley Road	6.2	Bridge	549988	5143768	No
State Forest Trail Crossing 2	7.7	Bridge	550588	5143068	No
Harlis Road	8.5	Culverts	549953	5142229	Yes
State Forest Trail Crossing 3	9	Bridge	549733	5141665	No
Private Road	9.2	Bridge	549638	5141388	No
State Forest Trail Crossing 4	9.6	Culverts	549245	5141003	No
Private Trail	10.7	Bridge	549835	5139868	No

Table 3. The average percentage of hourly water temperatures stressful (68°F-76.9°F) and lethal (>77°F) to Brook Trout¹ in Little Net River (S-000.7-002-001). Hourly temperature readings were obtained in 2002, 2003 and 2004 between June 1st and September 30th of each year.

Location	Years sampled	Miles from river mouth	% of hours stressful to Brook Trout	% of hours lethal to Brook Trout
CSAH 8	2002-2004	1.5	6%	0%
Bley Road	2002,2004	5.9	24%	2%

¹Brown, H.W. 1974. Handbook of the effects of temperature on some North American fishes. American Electric Power Service Corporation, Canton, Ohio. 524 p and App (12).

Table 4. Fish species sampled in Little Net River (S-000.7-002-001), 1985-2020.

Species	1985	1990	2011 (PCA)	2020
Black Bullhead				X
Blacknose Dace			X	X
Brook Trout	X			X
Brown Trout	X			X
Brook Stickleback			X	X
Central Mudminnow		X	X	X
Creek Chub		X	X	X
Common Shiner				X
Dace (species unspecified)	X	X		
Johnny Darter				X
Largemouth Bass				X
Longnose Dace				X
Mottled Sculpin	X			X
Northern Redbelly Dace			X	X
Northern Pearl Dace				X
Rainbow Trout	X	X		
Trout Perch				X
White Sucker				X

Table 5. Trout species captured in fish assessments in the Little Net River (S-000.7-002-001), 1985-2020.

			Number Captured/1000 feet - Pass 1								
			Young-of-the-year			Age-1+ and older			Total		
Station Number	Date	Station Length (ft)	Rainbow Trout	Brown Trout	Brook Trout	Rainbow Trout	Brown Trout	Brook Trout	Rainbow Trout	Brown Trout	Brook Trout
Below last falls downstream (E549058, N5148606)											
1.0	8/20/1985	450	58	4	4	18	27	4	78	31	9
1.0	8/21/1990	300	0	0	0	173	0	0	173	0	0
1.0	8/25/2020	760	0	0	7	0	1	12	0	1	19
			19	1	4	64	9	5	84	11	9
Upstream of CSAH 8 (E549094, N5147845)											
1.5	8/27/2020	756	0	0	0	0	0	0	0	0	0
PCA - Upstream of CSAH 8 (E549187, N5147814)											
1.6	6/14/2011		0	0	0	0	0	0	0	0	0
Bley Road (E549484, N5143781)											
5.7	8/21/1990	250	0	0	0	36	0	0	36	0	0
5.7	8/24/2020	723	0	0	0	0	0	0	0	0	0
Harlis Road (E549951, N5142213)											
8.5	8/21/1990	160	0	0	0	13	0	0	13	0	0
8.5	9/9/2019	500	0	0	0	0	0	0	0	0	0
Off Yellow Bird Trail (E549339, N5140295)											
10.3	8/20/2020	500	0	0	0	0	0	0	0	0	0

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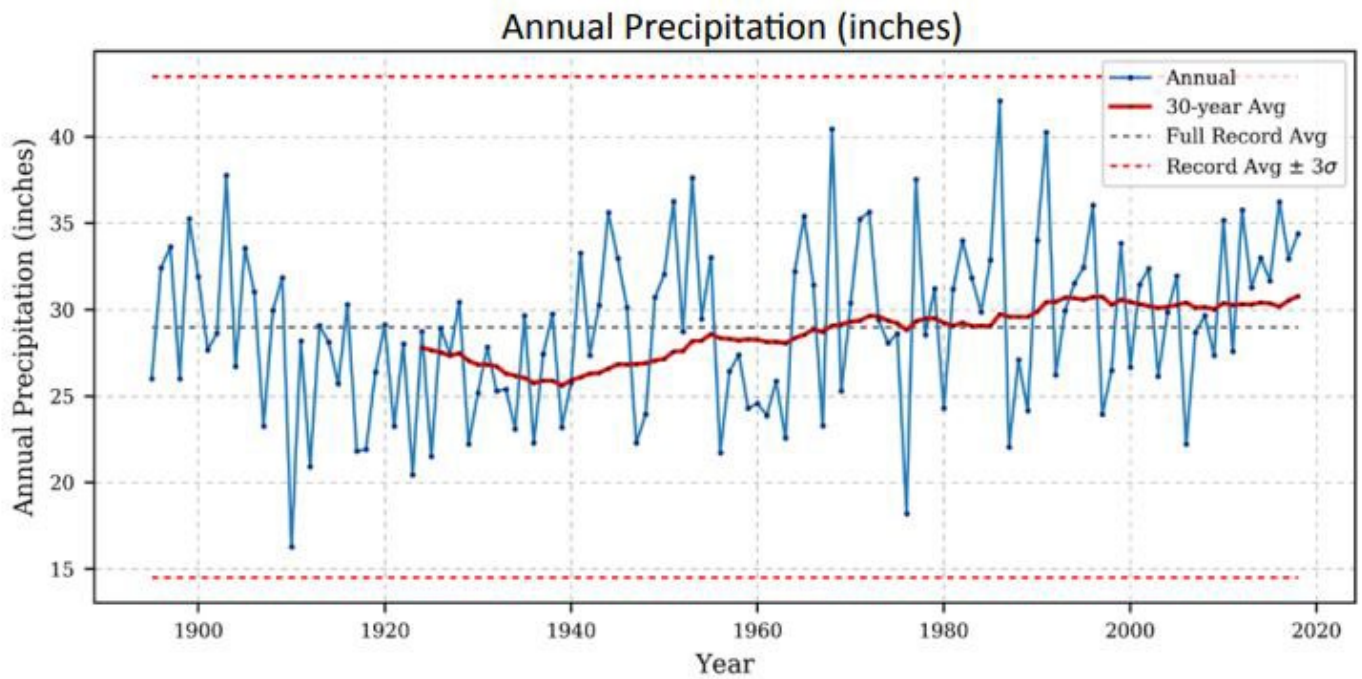


Figure 1. Annual average precipitation values (solid blue line) alongside the 30-year running average (solid red line) and the overall record average (dashed blue line). (Source: Climate Summary for Nemadji Watershed, June 2019. MNDNR Watershed Health Assessment Framework)

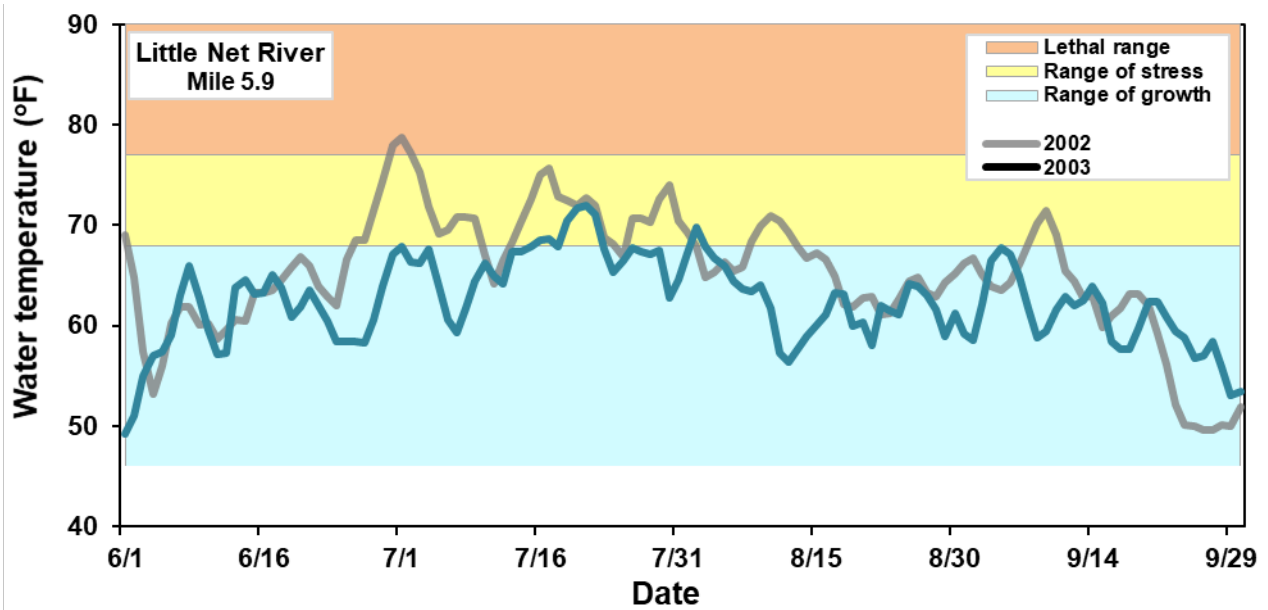
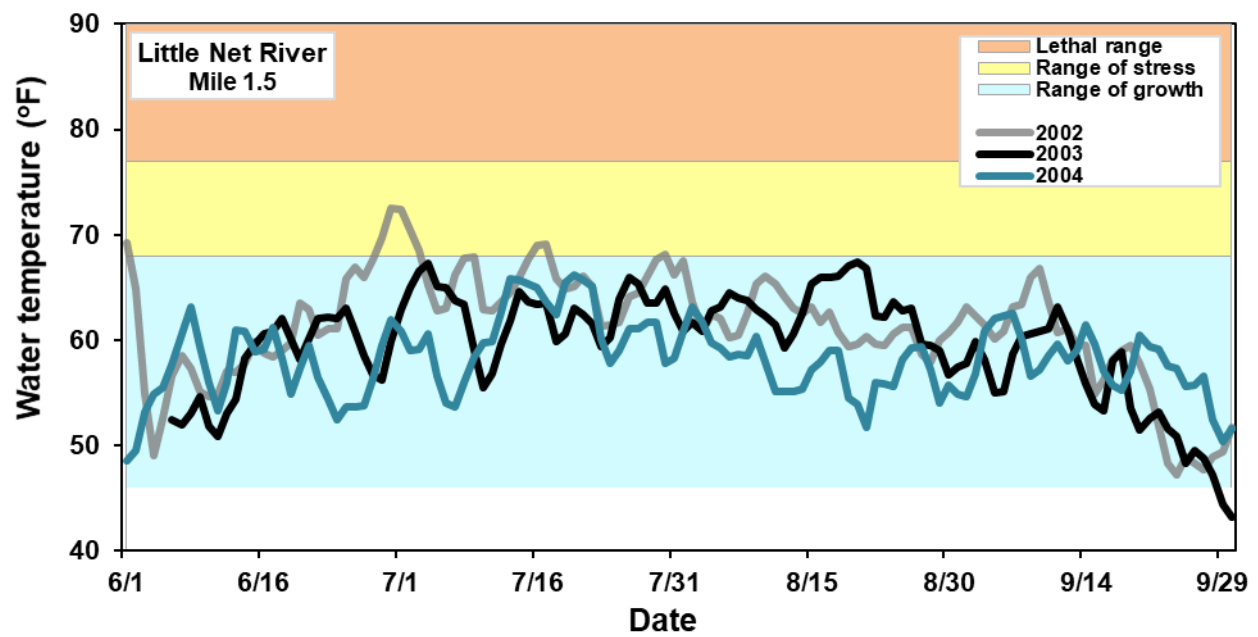


Figure 2. Mean daily water temperatures for each year at each station in Little Net River (S-000.7-002-001). Temperature ranges are for Brook Trout.

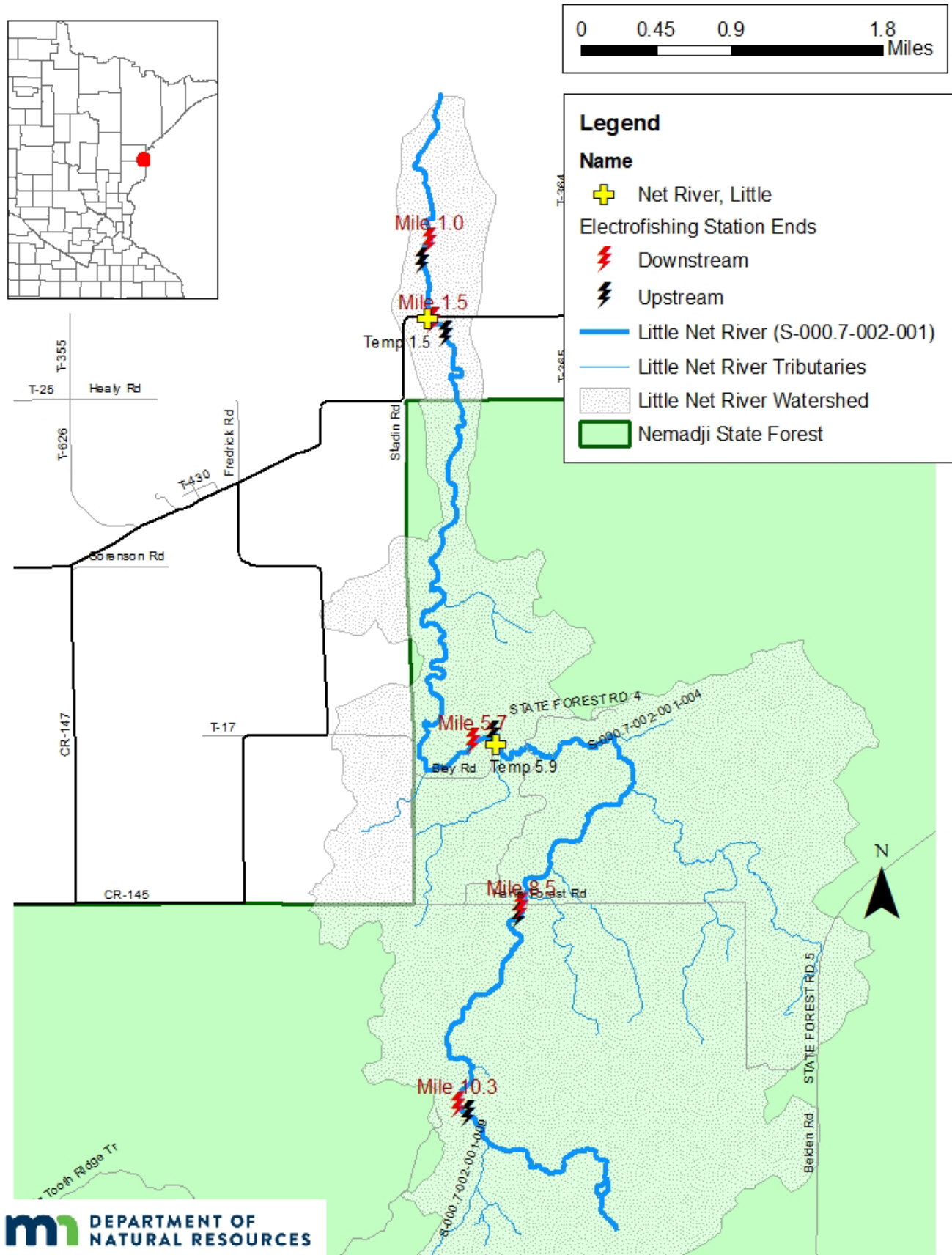


Figure 3. Historic sampling and temperature monitoring locations in the Little Net River (S-000.7-002-001).