

National Gypsy Moth Slow the Spread Program 2022 Program of Work

2022 STS Board of Directors Annual Meeting, February 8-9, 2022

Program Goal

The goal of the National Gypsy Moth Slow the Spread Program (STS) is to reduce the rate of spread of gypsy moth by at least 60% from historical levels (19.6 km/yr). The target rate of spread is 7.84 km/yr. Trapping and treatment programs across all landscapes represent the focus of the program.

2022 Funding

STS federal funding remained flat from FY2021 to FY2022 due to the continuing resolution (\$7,110,000, Table 1). Historical funding and treatment levels can be found in Appendix 1.

Table 1. Funding available for Slow the Spread in FY 2022.

Items	Funds (+/-)
STS operations	\$7,000,000
Technology development projects	\$110,000
FS costs	\$0
Total	\$7,110,000

Budget planning: Program funding remained flat at the start of FY2022 due to the continuing resolution for federal government funding. The continuing resolution was extended to February 18th. As a result, budget planning for the program used the initial \$7,110,000 as a planning number. Additional funds provided by the Forest Service in FY2021, unused state and foundation funding from FY2020, and unused funding for the purchase of racemic disparlure and mating disruption applications from FY2021 provide approximately \$1,089,000 for use in FY2022. These supplemental funds will mostly support the racemic disparlure purchase for FY2023 treatments (approximately 2,900 kg).

Following fall planning meetings and initial budget development, the STS budget was approximately \$255,000 over the current funding level. However, the cost per acre for mating disruption applications was unknown and an estimated cost was used for planning purposes, which may be inflated. A mating disruption contract cost should be known by mid- to the end of January. Reductions in treatment acres may occur after this new cost is determined. Planned treatment acres for FY2022 are located in Table 3.

Budget revision: Following the evaluation of the 2022 mating disruption contract prices, the application costs increased approximately \$454,000 from the previous 2017 contract prices for the equivalent acres. To align the FY2022 requests with the program budget, funding planned for the racemic disparlure purchase was eliminated (\$300,000) and treatment blocks were reduced or cut from Illinois, Indiana, Minnesota, and Wisconsin (approximately 17,000 acres). The reduction should not affect the racemic disparlure purchase for this year because of the carryover funds from previous years. However, if additional federal funds are not obtained in FY2022, treatment acres will likely be significantly reduced in FY2023 to plan for the purchase of the FY2023 racemic disparlure.

Match: Although STS is funded with a 25% match, the match is not required for funds used to manage federal lands in the program. The total match provided in FY2022 by the collaborating States was \$2,106,791 representing a 31% match for the funds needed by the STS Foundation. A match of \$1,571,260 is needed for the 2022 STS Foundation grant, representing 25% of the grant total.

Treatment vs trapping costs: Trapping and associated costs (e.g., databases, traps, and tablets) for FY2022 total approximately \$6.5M federal and state funds. Treatments are planned at \$3.25M (e.g., *Btk*, MD, NEPA, and racemic disparlure), treating 356,814 acres. Trapping continues to dominate the majority of the funding (64.6%) when compared to treatments (32.2%) and technology development (3.2%). However, the proportion of funds planned for treatments decreased this year. This is because the majority of the funds planned for the 2022 racemic disparlure purchase are coming from previous fiscal years and not accounted in the FY2022 funds. The mean cost of trapping was estimated at \$107.92/trap, an increase to trapping costs from 2021 (\$94.18/trap). The average cost per acre for treatment was estimated at \$9.12, a decrease from 2021 (\$9.58/ac), which is largely due to the lower racemic costs planned with FY2022 funds.

Table 1. Timeline and tasks associated with 2021 grants.

Who	Task	Send to	Due Date
All Cooperators	Final DRAFT budgets to reflect cuts	T. Coleman	1 Feb 2022
Foundation Board	Review and finalize the budget and plan of work	At the meeting	7-9 Feb 2022
Foundation	Budgets and narrative compiled into a program document; 424 prepared and submitted to the FS for full funding of \$4.71 million	R8 grants specialist with cc's to T. Coleman	Mid- to late Feb 2022
Foundation (Georgia)	Issue letters of cost incurrence to states as requested for critical needs	States	As requested by mid- to late Feb
States	State 424 packages are due to the Foundation; grant period of 1/1/21 to 6/01/22	G. Brock with cc's to P. Wilson. and T. Coleman	Starting March, but due no later than June 1
Foundation	The Foundation can begin to award subgrants to the states	State grants person with cc to Foundation representative	As soon as FS funds are awarded to the Foundation

2022 Program Planning

The Action Area (AA) and program bounds shifted west in northern Minnesota and Wisconsin and south in Indiana and along the southern Appalachian Mountains in FY2022 (Fig. 1). The program bounds closely track the STS Decision Algorithm (DA) bounds in most states except in NC and VA where the DA bounds are erratic. The AA from the DA were planned to smooth

spikes in the DA where populations have either increased or decreased and to sustain the AA where treatments have been focused for several years. The DA bounds extended into South Carolina for the first time in the program. However, the program bounds did not reflect this southern projection because these DA projections should retreat in this area. The monitoring zones were adjusted accordingly to maintain two quads deep for the monitoring zone I and capture the 10-mothline in each state.

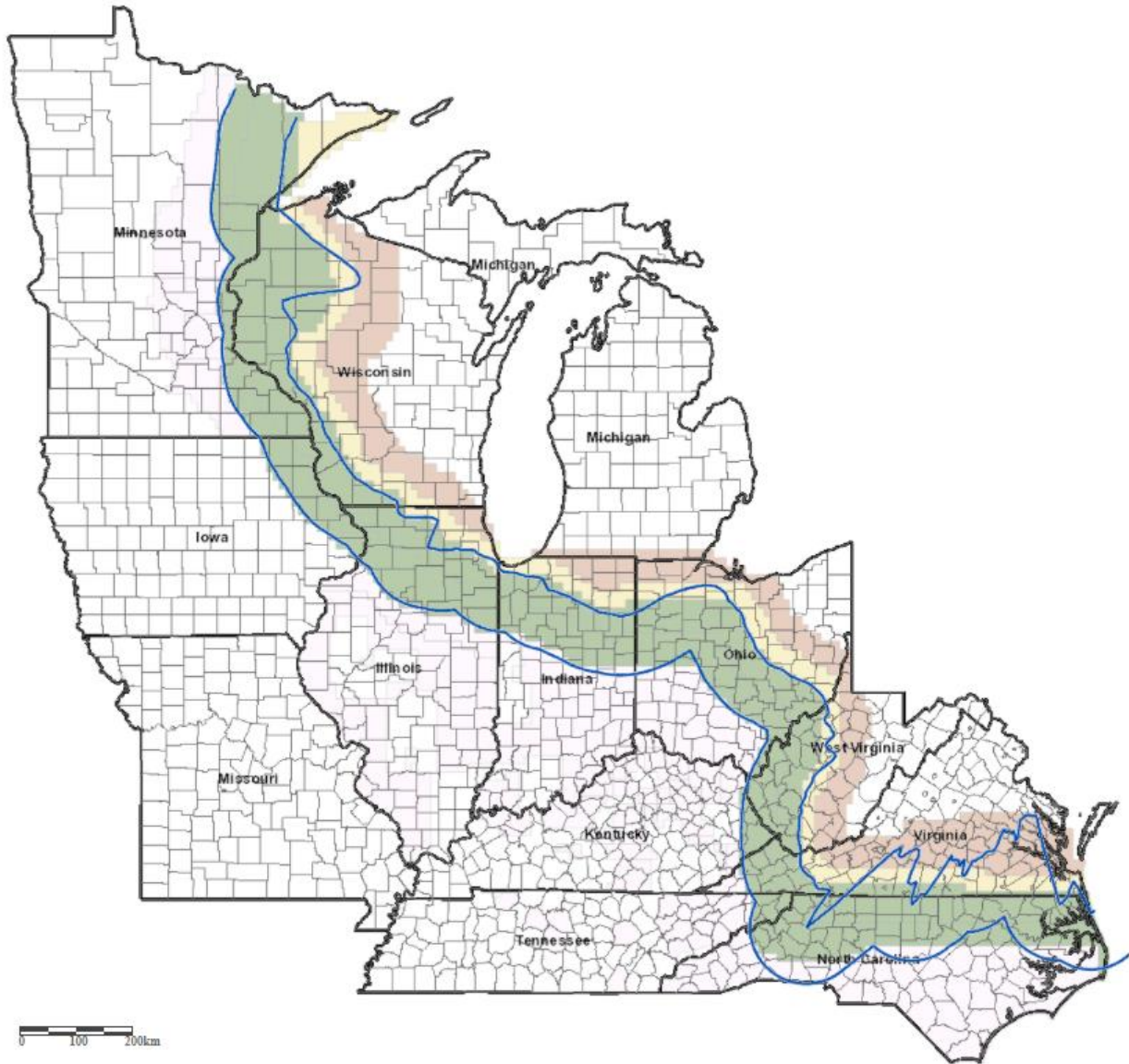


Figure 1. Program boundaries [action area (green), monitoring zone I (yellow), and monitoring zone II (pink)] and STS decision algorithm (DA, blue lines) established for 2022.

Population Growth Models

Populations increased in all those same areas where the DA bounds shifted (i.e., northern Minnesota and Wisconsin, Indiana, and along the southern Appalachian Mountains) (Fig. 2 and 3). Mothlines were closest in southeastern WI and West Virginia (Fig. 4), representing higher moth spread in these areas (see also Appendix 2, Table 1).

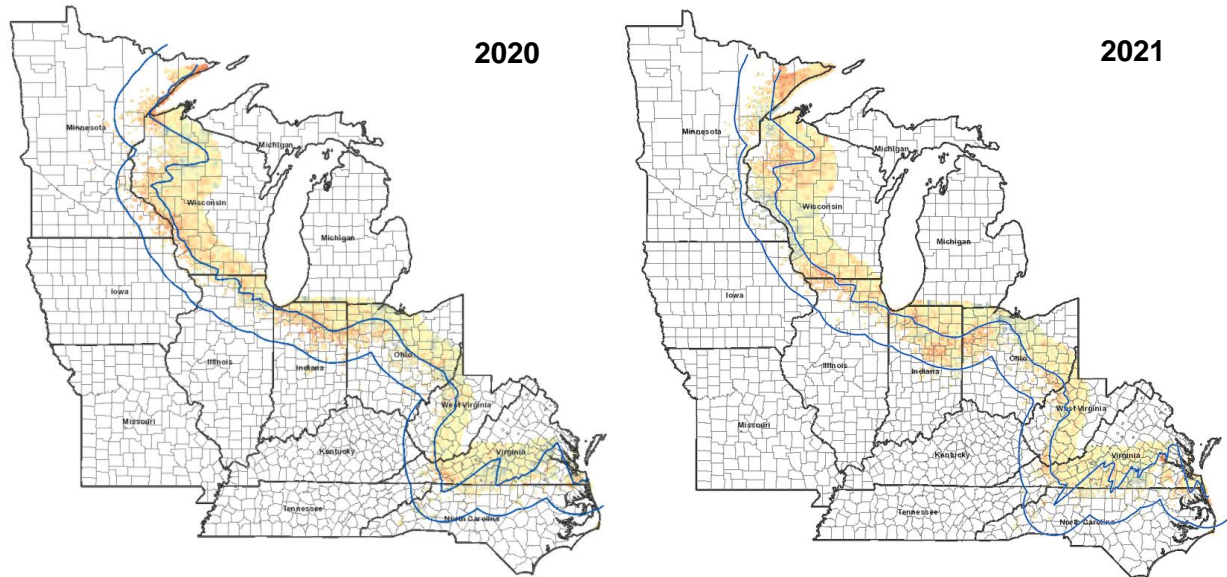


Figure 2. Gypsy moth population growth from 2020 to 2021. Cooler colors show negative moth trap catch, whereas warmer colors show positive moth trap catch. Populations increased in northern Minnesota and Wisconsin, along the Indiana and Ohio state line, and along the southern Appalachian Mountains.

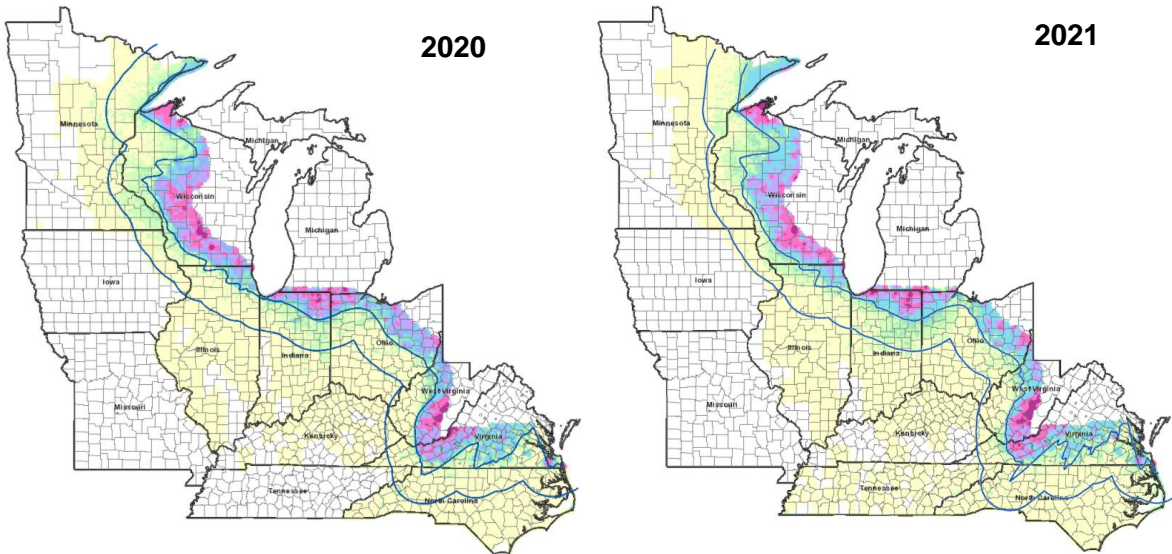


Figure 3. Surface interpolation of gypsy moth trap captures depicted across the program area from 2020 and 2021. Cooler colors show building populations.

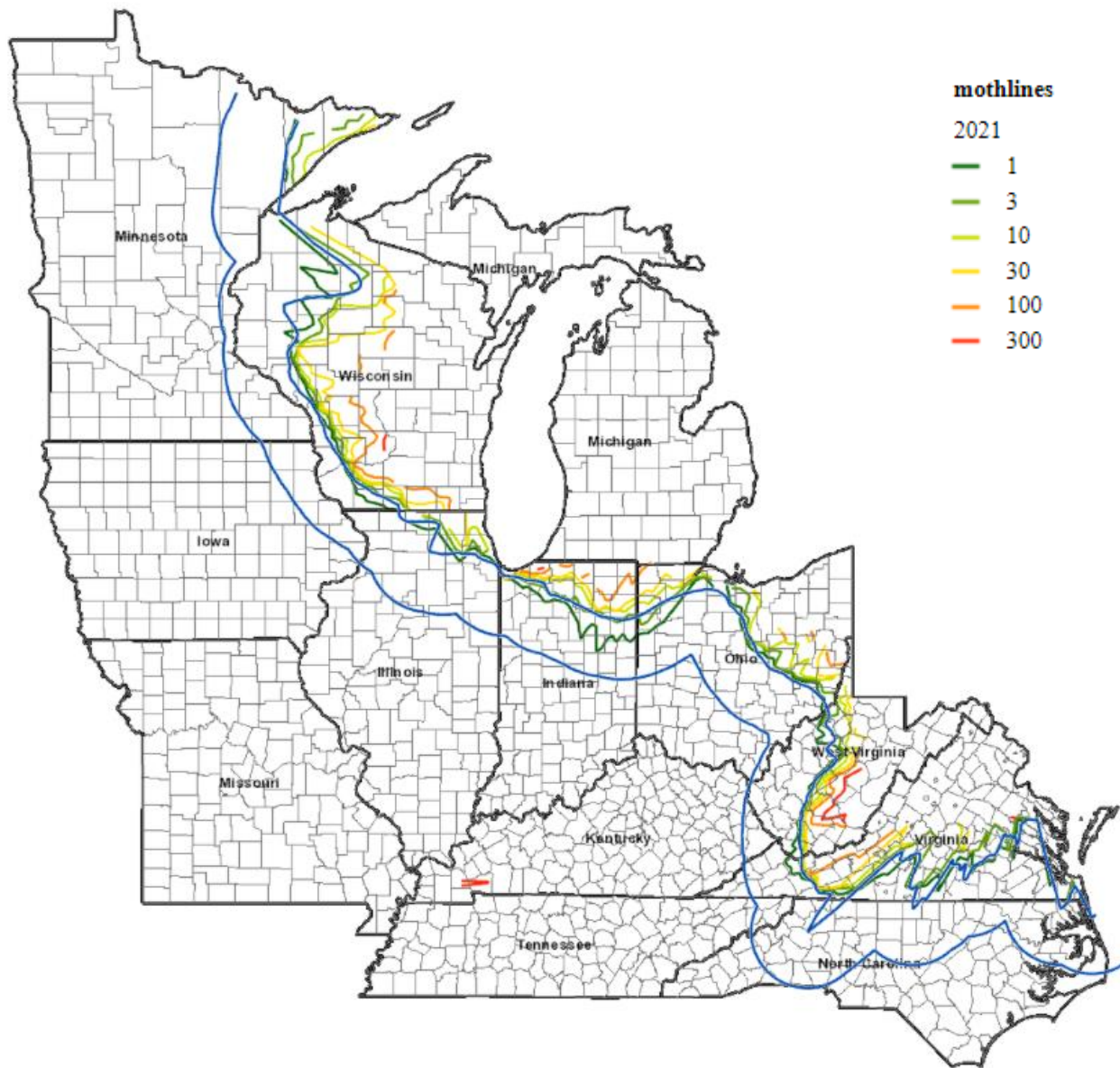


Figure 4. Mothlines modeled in 2021 in STS. Spread rate is calculated by averaging the distances of each of the six trapping thresholds (1-, 3-, 10-, 30-, 100-, and 300- moth abundance thresholds).

Trapping

Total trap numbers planned for the AA and monitoring zones increased from 61,925 in 2021 to 63,371 in 2022 (Table 2). The number of DA recommended delimits (post-treatment delimits and delimits) increased from 160 in 2021 to 189 in 2022. Trapping at mill sites with compliance agreements will continue in 2022 in coordination with the Regulatory Committee.

Table 2. Numbers of traps planned from 2020 to 2022 in STS.

State	Number of traps planned		
	2020	2021	2022
IA	1,925	1,790	1,979
IL	5,577	5,258	5,653
IN	5,069	5,060	5,233
KY	743	503	489
MI	64	64	69
MN	6,173	9,293	9,372
NC	8,699	10,306	10,277
OH	9,704	9,203	9,082
TN	568	591	783
VA	4,649	5,515	5,573
WI	10,191	10,450	10,953
WV	3,929	3,892	3,993
Total	57,291	61,925	63,456

Treatments

For 2022, the STS Decision Algorithm (DA) identified and analyzed the following potential problem areas (PPA) based on the 2020 and 2021 moth capture data:

- 608 PPAs total
- 27 PPAs recommended for treatment
- 189 PPAs recommended for pre- or post-treatment delimiting
- 392 PPAs recommended for no action

The total number of PPAs increased from 2021 to 2022 and recommendations for “delimit” and “no action” also increased. Recommendations to “treat” decreased from 2021 to 2022. Following the fall planning meeting, 156 treatment blocks (526,950 polygon acres and 356,814 treatment acres) were planned throughout the program (Fig. 5), but 145 remained following budget cuts (Table 3.)

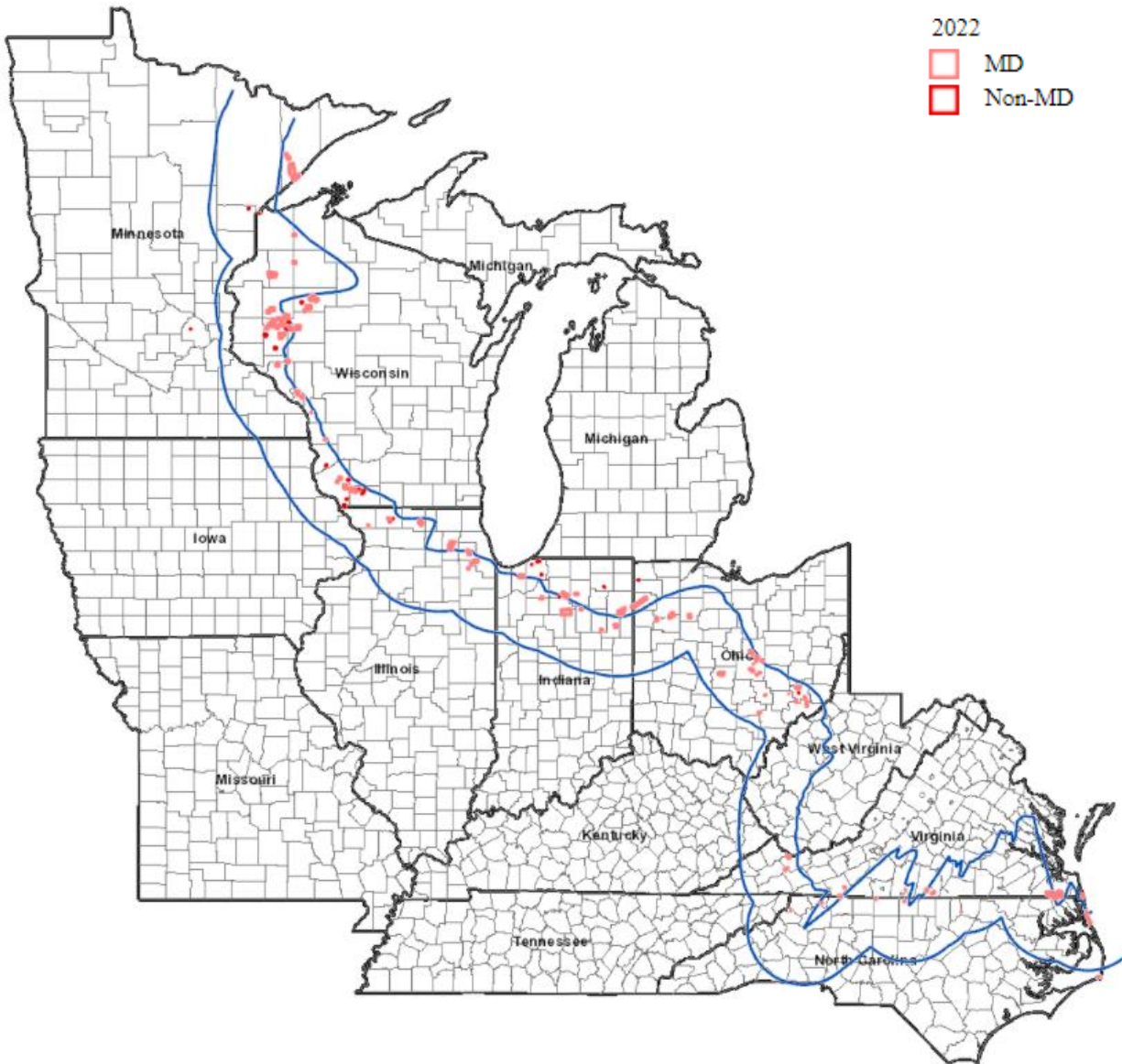


Figure 5. Treatments planned for 2022 in STS.

Table 3. Treatment acres proposed in 2022 by STS participating states.

State	# of Blocks	Total treatment acres	Treatment acres							
			Btk x 1	Btk x 2	Mimic	Dimilin (ground)	Gypchek (x1)	MD 6g	MD 15g	MD Total
IA	0	0	0	0	0	0	0	0	0	0
IL	17	30,842	1,008	311	0	0	0	29,523	0	29,523
IN	13	18,274	665	0	0	0	0	14,514	3,095	22,937
KY	0	0	0	0	0	0	0	0	0	0
MN	4	45,540	0	490	0	0	0	45,050	0	45,050
NC	11	15,600	0	0	0	0	0	15,600	0	15,600
OH	26	51,651	762	0	0	0	294	50,595	0	50,595
TN	0	0	0	0	0	0	0	0	0	0
VA	16	57,096	0	0	0	0	8,376	48,220	500	48,720
VA study plots	4	500	0	0	0	0	0	250	250	500
WI	54	116,455	2,775	6,680	0	0	0	99,000	8,000	107,000
WV	0	0	0	0	0	0	0	0	0	0
Total	145	335,958	5,210	7,481	0	0	8,670	302,752	11,846	314,597

Additional work linked to STS

One eradication block (MN) and nine suppression blocks (2 in OH and 7 in IN) are planned for 2022. There are four study plots planned (500 acres) for treatment under the mating disruption contract in addition to the operational STS blocks shown in Table 3.

Appendix 1. Historical funding levels and activities

Figure 1. Federal resources (%) allocated to survey and treatment programs from 2000-2021. Arrows above the bars indicate the four periods with different trapping protocols or widths of the AA.

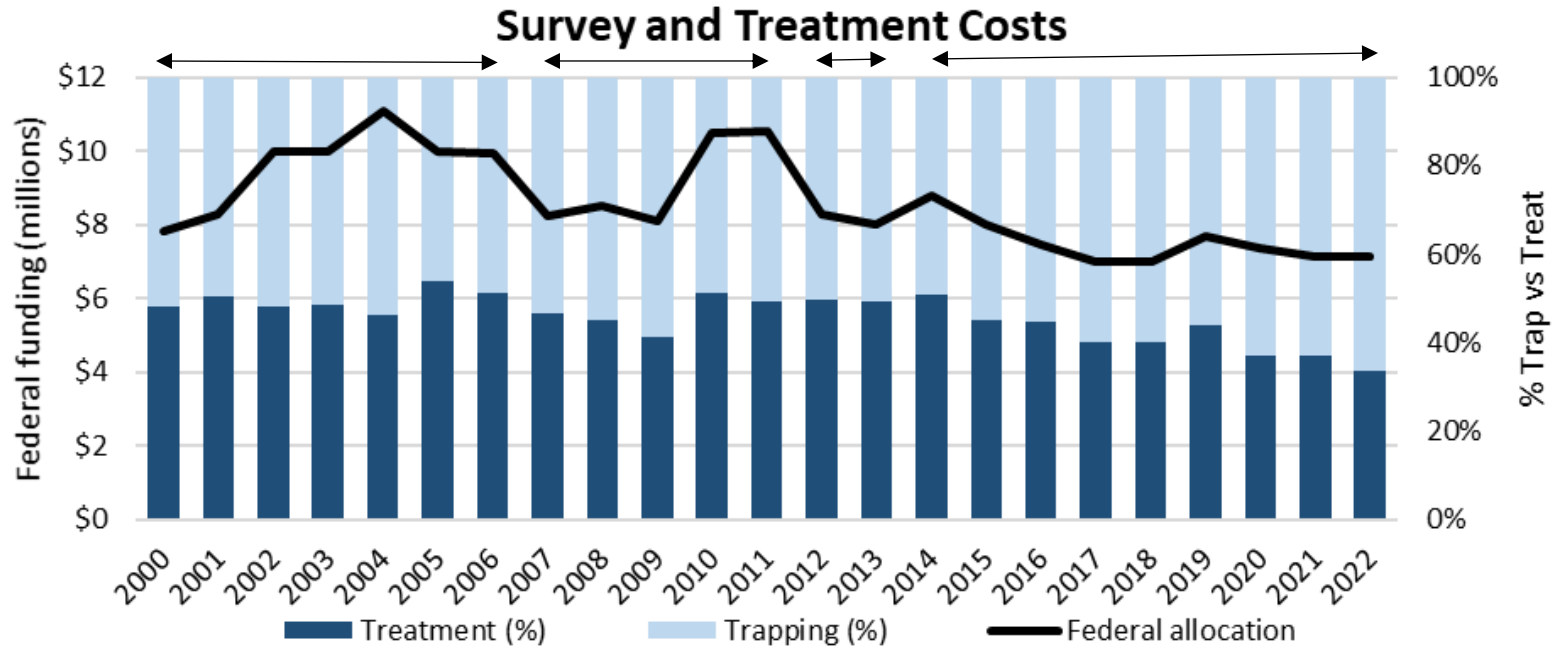
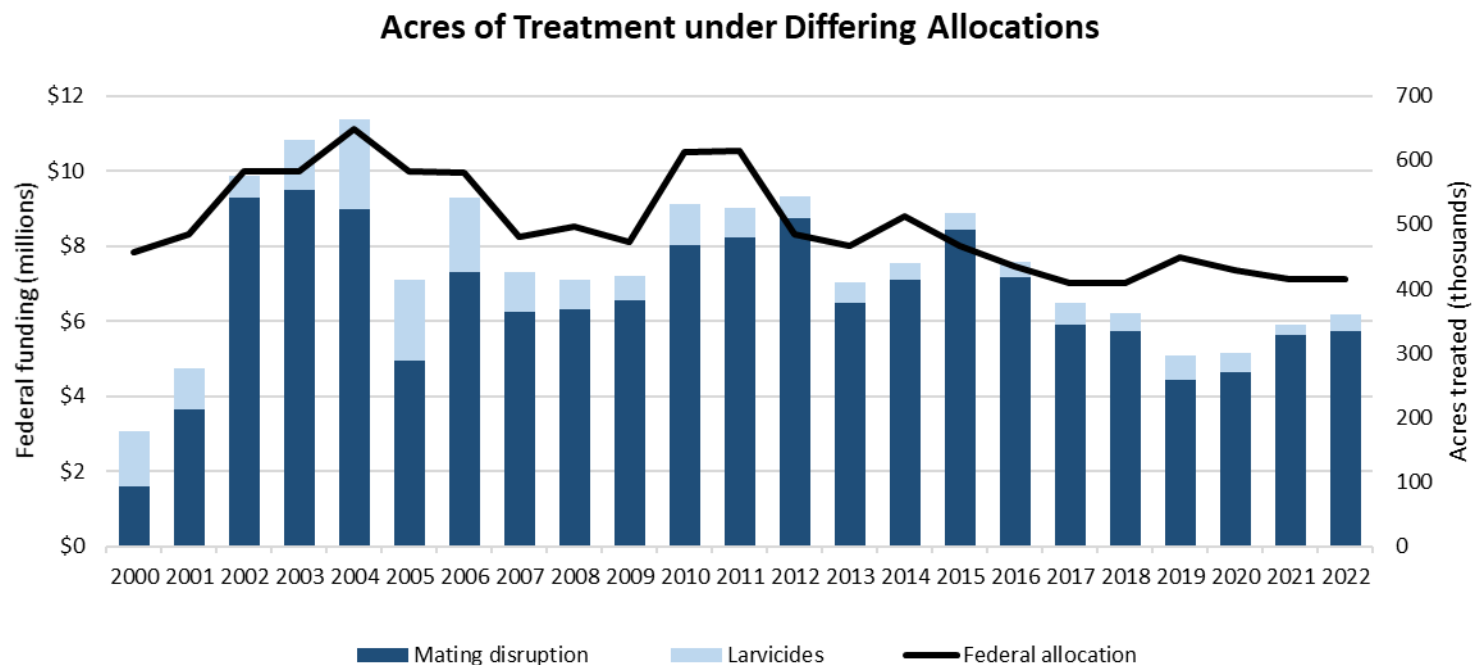


Table 1. Annual federal funding allocated to STS operations and associated width of the action area, base grid trap spacing, numbers of traps planned, and acres of treatment (2013-2022).

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Allocation (millions)	\$8.0	\$8.78	\$8.0	\$7.46	\$7.0	\$6.8	\$7.68	\$7.36	\$7.11	\$7.11
Action area width (km)	100	100	100	100	100	100	100	100	100	100
Action area base grid spacing	3k	0-50 km trapped at 2 km, 50-100 km trapped at 3km								
Number of traps (thousands)	47	60	61	65	65	62	61	57	61	63
Acres treated (thousands)	411	424	517	416	374	356	297	271	375	356

Figure 2. Acres treated from 2000-2022 under fluctuating federal allocations.



Appendix 2. Spread Models

There are numerous estimates of historical rates of spread that range from 9 to 35 km per year. For STS, we use 19.6 km per year as the historical rate, which is the average of two of the mid-range estimates (Liebhold et al. 1992; Sharov et al. 1998). The program's target rate of spread is 40% of 19.6 or 7.84 km/yr.

Table 1. Location of zones where spread was measured and calculated spread (km/yr) in each of the 12 zones from 2016 to 2020 in STS.

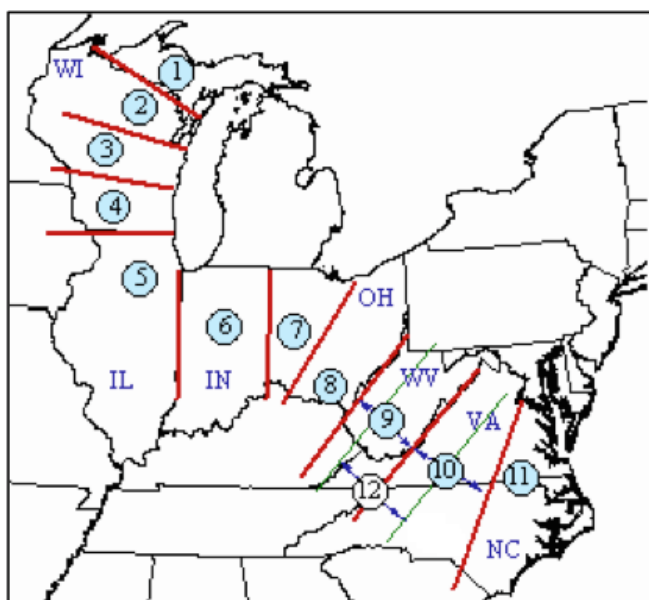


Figure 1. The 12 zones used to calculate spread in STS.

Zone	Mean Spread in 2017	Mean Spread in 2018	Mean Spread in 2019	Mean Spread in 2020	Mean Spread in 2021
1	NA	NA	NA	NA	24.54
2	-6.35	-41.3	23.6	-5.15	50.48
3	2.5	-2.6	-4.87	12.39	18.76
4	6.3	3.6	-15.48	10.36	9.51
5	-12.0	8	-17.49	-3.51	5.61
6	-8.9	7.1	-6.73	8.42	10.37
7	-6.0	11.9	-4.2	-1.01	-2.06
8	-9.4	9.8	-8.16	-4.82	3.48
9	-0.1	-10.3	0.52	-1.92	12.25
10	-25.8	-14.2	2.72	-8.98	23.37
11	-30.9	-0.8	9.35	-17.04	-7.65
12	-0.6	-8.2	-1.58	1.43	26.94
mean	-8.29	-3.36	-2.03	-0.89	14.6

STS Program

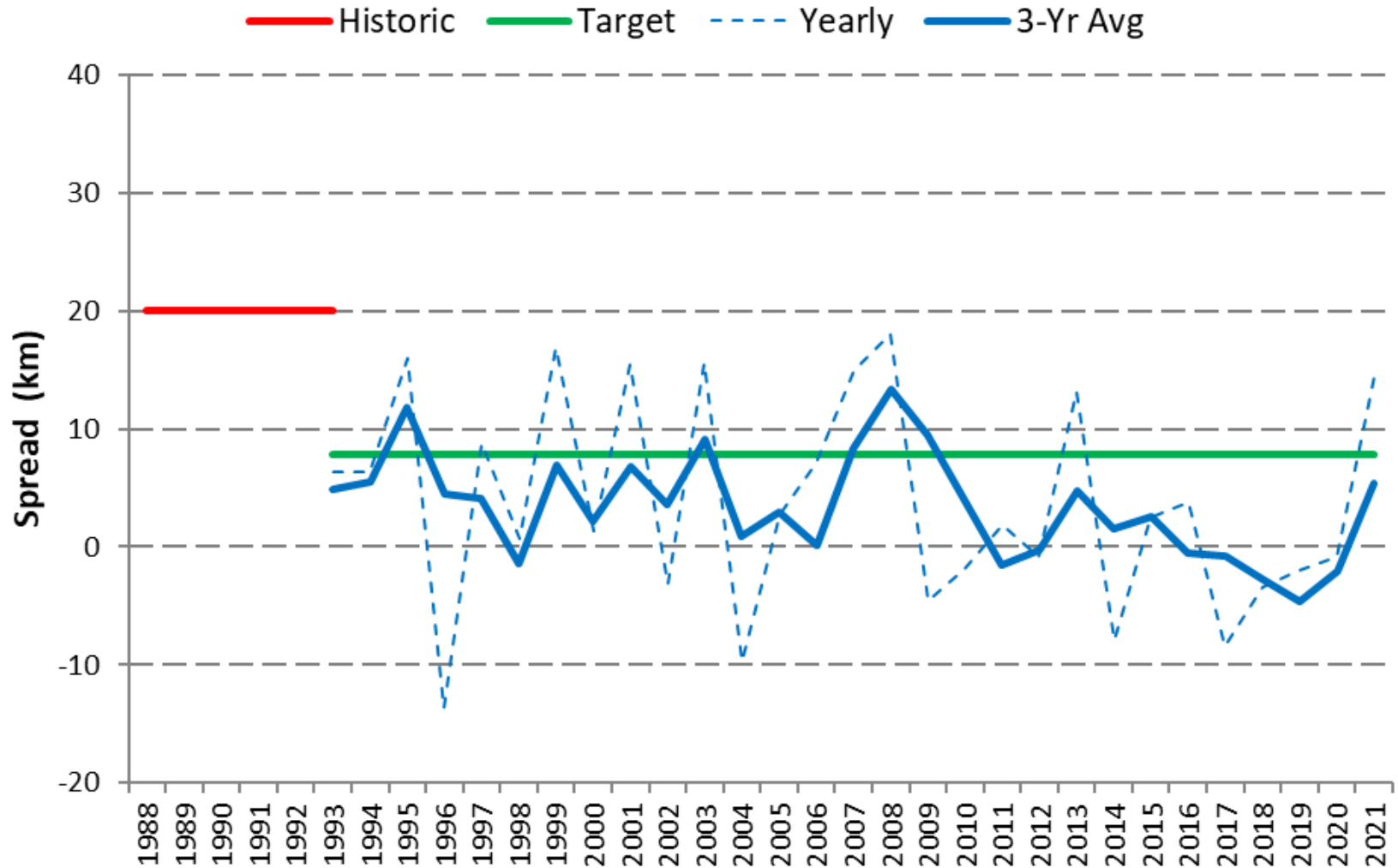


Figure 2. Program spread rate depicted from 1988 to 2020 [red is the unrestricted rate of spread (19.6 km/yr), green is our target rate of spread (7.8 km/yr) and blue is the observed annual rate of spread or smoothed in 3-yr windows].

Southern Region of STS

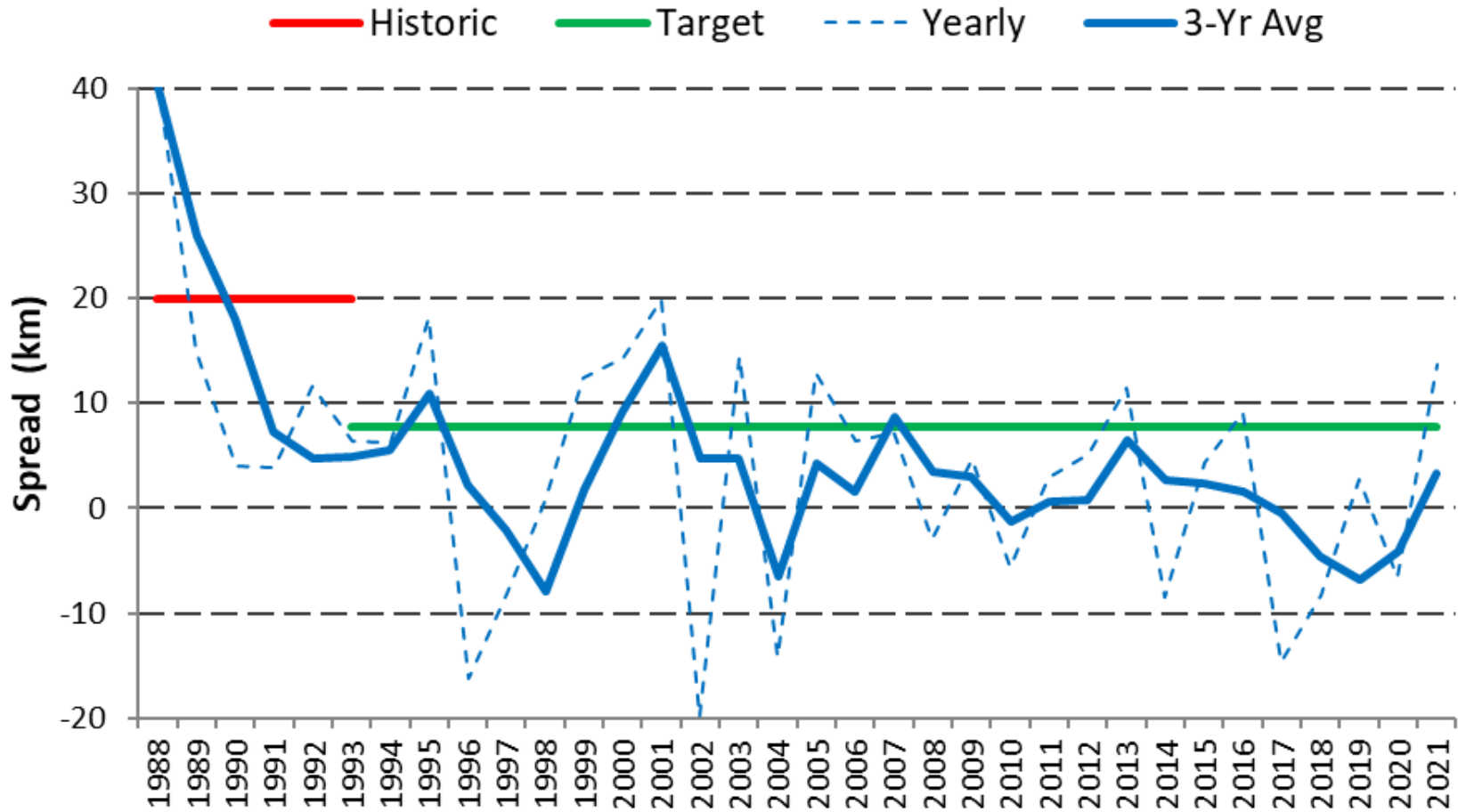


Figure 3. Regional spread rate depicted from 1988 to 2021 for the Southern Region (NC, TN, VA, and WV) [red is the unrestricted rate of spread (19.6 km/yr), green is the target rate of spread (7.8 km/yr) and blue is the observed rate of annual spread or smoothed in 3-yr windows].

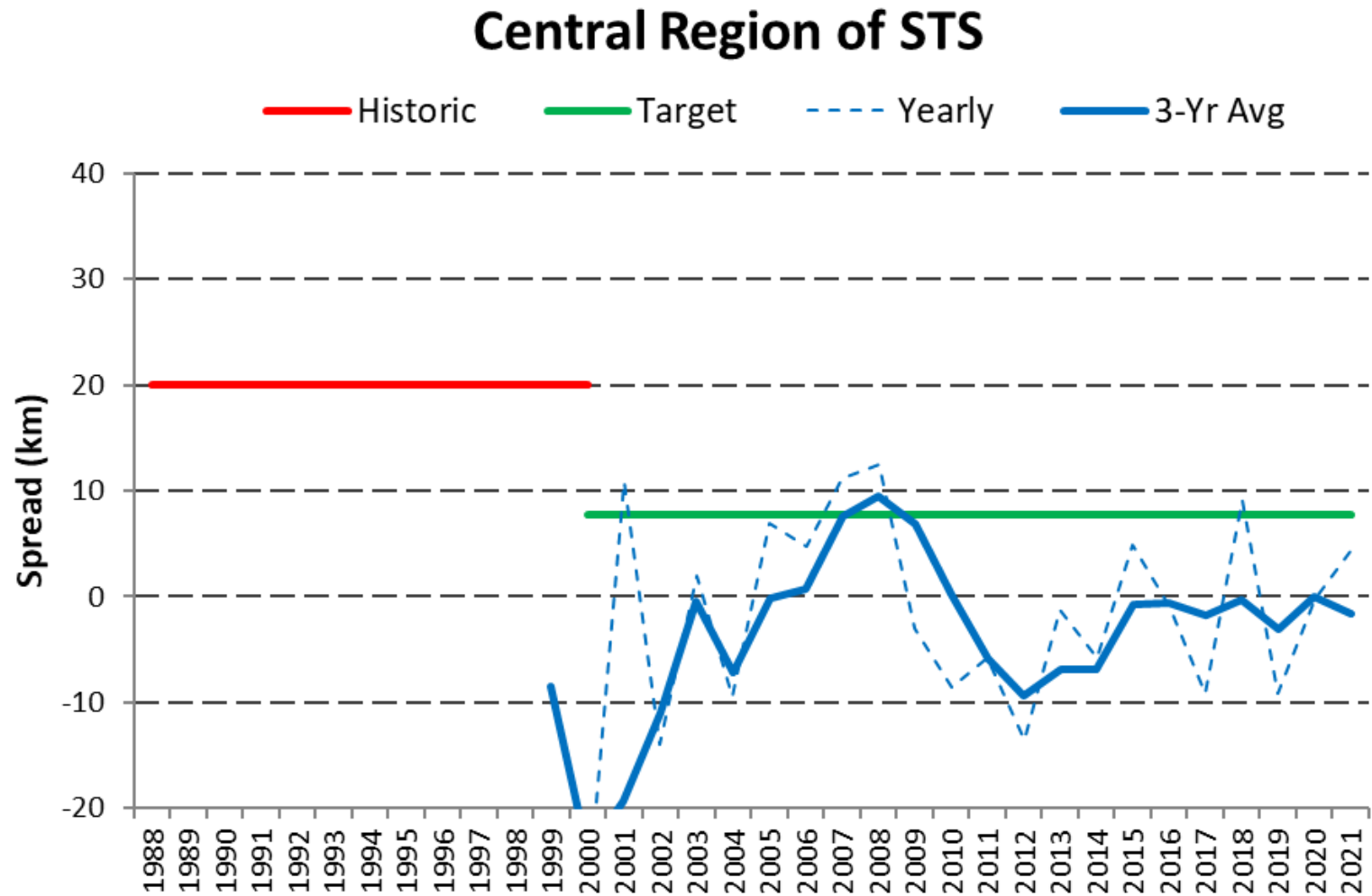


Figure 4. Regional spread rate depicted from 1988 to 2021 for the Central Region (IL, IN, and OH) [red is the unrestricted rate of spread (19.6 km/yr), green is the target rate of spread (7.8 km/yr) and blue is the observed rate of annual spread or smoothed in 3-yr windows].

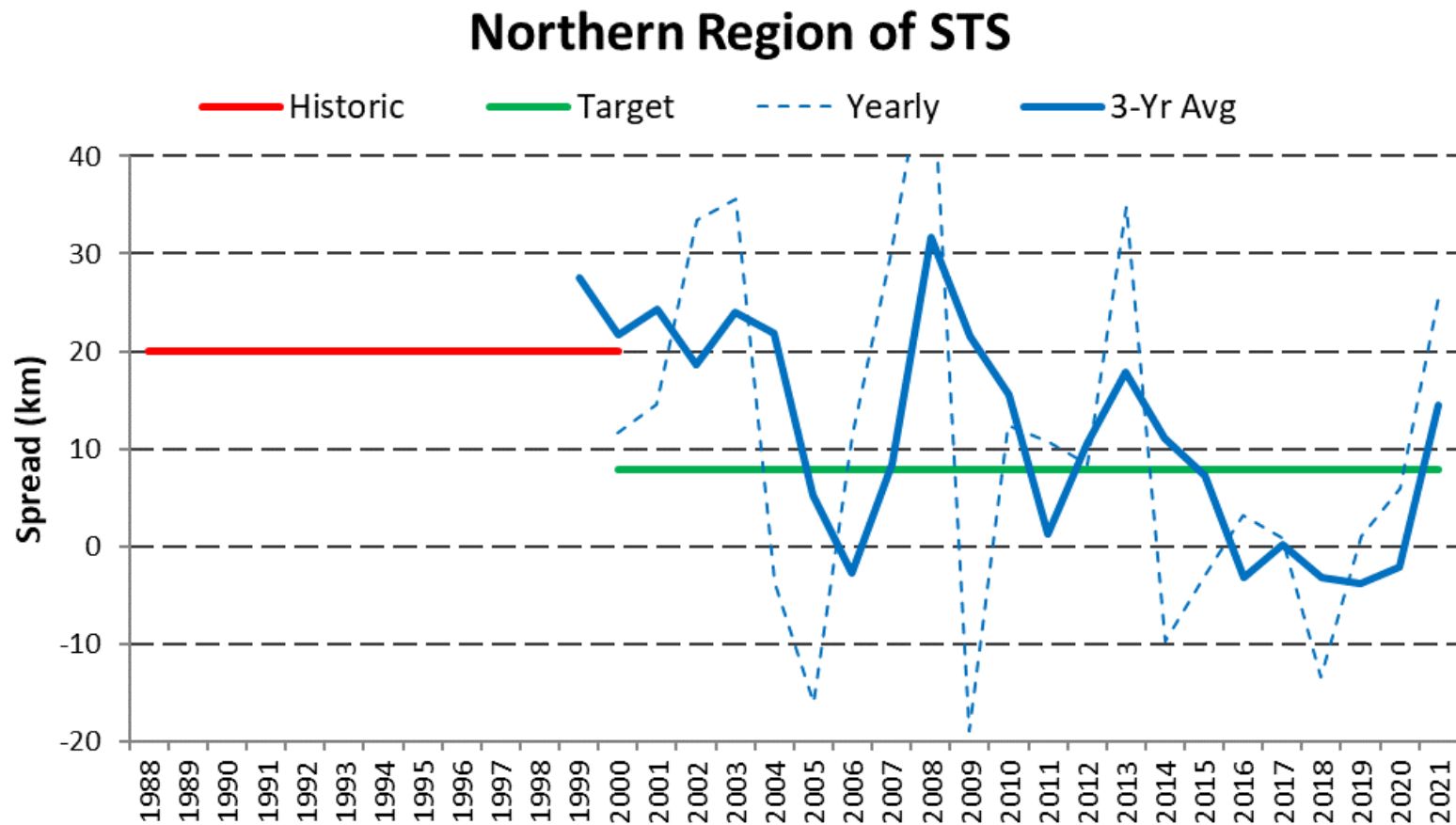


Figure 5. Regional spread rate depicted from 1988 to 2021 for the Northern Region (IA, MN, and WI) [red is the unrestricted rate of spread (19.6 km/yr), green is the target rate of spread (7.8 km/yr) and blue is the observed rate of annual spread or smoothed in 3-yr windows].

Appendix 3. Duties associated with STS

States

State cooperators manage STS trapping and treatment programs within their state. Annual budgets and planning will be coordinated with the STS Program Manager in late fall to early winter of each year. Depending on the ability of individual states to hire trappers, trappers are hired by the state or contracted through the STS Foundation, but coordination, supervision, and quality assurance/control of trappers is managed by state partners. States manage STS treatment programs, coordinating and implementing *Btk* applications. Forest Service will work cooperatively with states to implement mating disruption blocks, but local planning is conducted by the state. States are required to complete environmental analyses for all treatment blocks. State will record trap and treatment information in the STS database and submit reimbursements for this work to the STS Foundation. State reports will also be submitted to the STS Foundation for subawards.

Databases

Data Management and GIS: Data management and project evaluation will continue to be shared by Virginia Tech and Michigan State Universities. All standard products and support will be maintained in 2021. The primary focus of the Information Systems Group for 2021 is the new trapping data collection workflow, including Collector maps, custom QC services, and expanded editing capabilities for state trapping managers. Other development projects ongoing for 2021 include providing access to archived data via STS reports and web tools, enhancing and expanding online database editing, and automating QC and NAPIS reports. Field map production in 2021 will be completed at MSU and includes digital file production, plotting, lamination, and QR codes. VT and MSU will work together to develop any additional functionality requested and to ensure the best use, and widest implementation, of our web maps and applications among project users. GIS development will target QC functions of our online editing tools, a new project trapping dashboard, and investigating service area design and routing tools. The greater database group also will continue discussion regarding updating the current STS website to give it a modern interface, and to include expanded use of story maps.

STS Decision Algorithm (DA)

The most recent implementation of the DA will remain in place in 2021. Since 2018, DA development was put on hold as we devoted time and resources to updating our server architecture. For 2021, our new architecture is in place and we are now equipped to run a ‘research DA’ instance. We will coordinate our efforts with the STS Operations and Technical Committees to determine future development projects.

STS Trapping Data Stream: In 2020, the new trapping workflow (G4) was put into production for 3 states. Hardware and software failures forced other states to switch to the G4 workflow from the G3 workflow mid-season, which created many errors that needed to be corrected outside our standard error correction processes. In 2021, all states will be using the G4 workflow from the beginning of the season. Trapper training materials will be available and STS developers will conduct remote training webinars for state managers and lead workers prior to the trapping season. States continue to need the option to submit data via GPS devices in some

scenarios. so we will continue to provide and support Atlas as a tool to submit GPS recorded data to the database.

Technical Committee

Technology development projects are coordinated by the technical committee, which is led by Ksenia Onufrieva (VT). Some of the practical applications that have been funded by this work include improving mating disruption applications (K. Onufrieva); assessing factors driving population growth, evaluating the efficacy of STS treatments, and assessing non-target effects of *Btk* applications (J. Walter and D. Johnson); and assessing the variation of developmental traits along the invasion front (D. Parry and K. Grayson). There are \$70,000 allocated for funding for technology development projects in 2021.

Forest Service Duties

Program Management: Tom Coleman will continue to provide program management for the STS program, develop the budgets, treatments, and trapping efforts with the states; coordinate the grants for the Foundation and Virginia Tech database and technology development; and manage the mating disruption contract [contract awarded in 2017 and four option years (2018 - 2021)]. Derek Puckett, Chris Hayes, Patrick Engelken, John Kyhl and several entomologists from the St Paul Field Office (Marissa Striefel and Steve Katovich) will continue to assist with STS and other gypsy moth issues (e.g., environmental assessments). John Kyl will manage the MSU database grant. Assistance with budgets, work plans, NEPA and other program planning duties will be provided to cooperators as needed.

Foundation Duties

Administration: Georgia Brock (Four Oaks, NC), will provide administrative services for STS, which include but are not limited to purchasing, administering and paying trapping contracts, reimbursing states for STS program work and travel, managing and tracking grant compliance, and assisting the accountants during the audit.

Purchasing, Contracts, and Travel: The Foundation will continue to purchase racemic disparlure with the FS providing the technical specifications and APHIS providing the quality control and storage. The Wisconsin applicator will continue to invoice the Foundation for *Btk* used on the Wisconsin project. With technical oversight from NCDA, IDA and TDA the Foundation will solicit quotes and make awards for the 2020 trapping contracts in North Carolina, Illinois, and Tennessee. Georgia can make other miscellaneous purchases at the request of Board members or FS. Cooperator travel can be reimbursed (at federal rates) by the Foundation provided a voucher is submitted through Tom Coleman for review and approval.