

MARCH 26, 2024

# Trails in the Age of Climate Change: Disaster Recovery



Lamoille Valley Rail Trail, VT | Photo by Tom Sexton

# Before we begin...

- Drop your questions in the Q&A box.
- Send your technical assistance questions to: <https://rtc.li/technical-assistance>
- In the event you run into technical difficulties during the webinar, here's how to troubleshoot:
  - Log out and back into the webinar
  - Webinar ID: 872 9983 3135
  - Browse Zoom Customer Support topics & contact Customer Support: <https://support.zoom.us>
- Live transcription is enabled for this webinar

# Panelists



**Joshua Bell**

Operations Manager, Operations  
& Landscape Management,  
Philadelphia Parks & Recreation  
[joshua.bell@phila.gov](mailto:joshua.bell@phila.gov)



**Eric Williams**

Natural Resources Planner,  
Papio-Missouri River Natural  
Resources District  
[ewilliams@papionrd.org](mailto:ewilliams@papionrd.org)



**Melissa Vanlanduyt**

Recreation Partnerships Section  
Chief at Wisconsin Department of  
Natural Resources (DNR)  
[Melissa.Vanlanduyt@wisconsin.gov](mailto:Melissa.Vanlanduyt@wisconsin.gov)



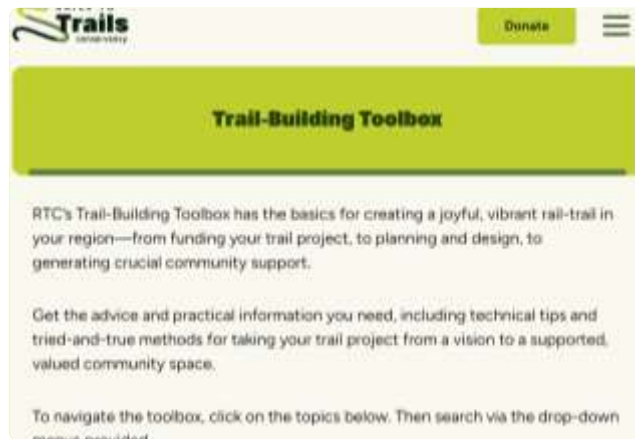
**Andrew Haffele**

Superintendent of Wildcat  
Mountain Work Unit, Bureau of  
Parks and Recreation  
Management, Wisconsin DNR  
[andrew.haffele@wisconsin.gov](mailto:andrew.haffele@wisconsin.gov)

# Trails and Climate Change

- Climate change is a contributor to MORE INTENSE EXTREME WEATHER EVENTS that can cause expansive and dangerous damage to trails.
- Trails have a role to play in MAKING SPACES MORE RESILIENT, including as acting green corridors that can help mitigate against urban heat, help with stormwater management and provide valuable access to the outdoors.
- The environmental and CLIMATE-RELATED VULNERABILITIES WILL ALSO AFFECT THE SITING, PLANNING, DESIGN, CONSTRUCTION AND MANAGEMENT OF TRAILS, including the costs of all these steps.
- There are PUBLIC FUNDING OPPORTUNITIES related to climate change mitigation and increasing resilience.
- Trails contribute to LOCAL ECONOMIES AND COMMUNITY HEALTH, EQUITY & VITALITY.

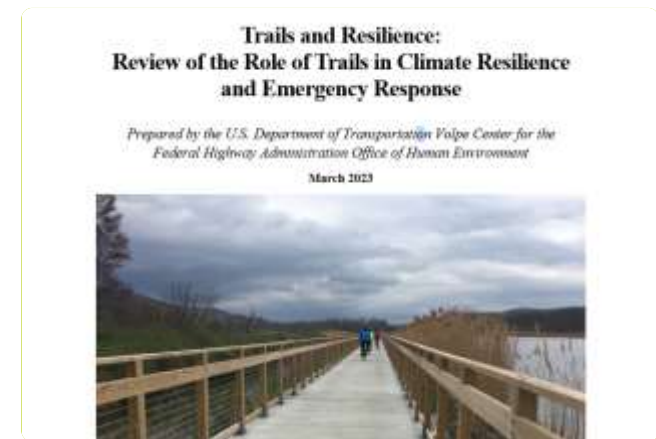
# Resources



Trail-Building Toolbox:  
TRAILS AND CLIMATE  
RESILIENCE



TRAILS AS RESILIENT  
INFRASTRUCTURE  
(FHWA, 2023)



TRAILS AND RESILIENCE:  
REVIEW OF THE ROLE OF TRAILS  
IN CLIMATE RESILIENCE  
AND EMERGENCY RESPONSE  
(FHWA, 2023)



*What we used to think of as once-in-a-lifetime storms and floods are coming more often now, and trails are in the crosshairs*

*-Tom Sexton, Northeast Regional Director,  
Rails to Trails Conservancy*

Ohio & Erie Canal Towpath  
Photo courtesy of Jason Cohen

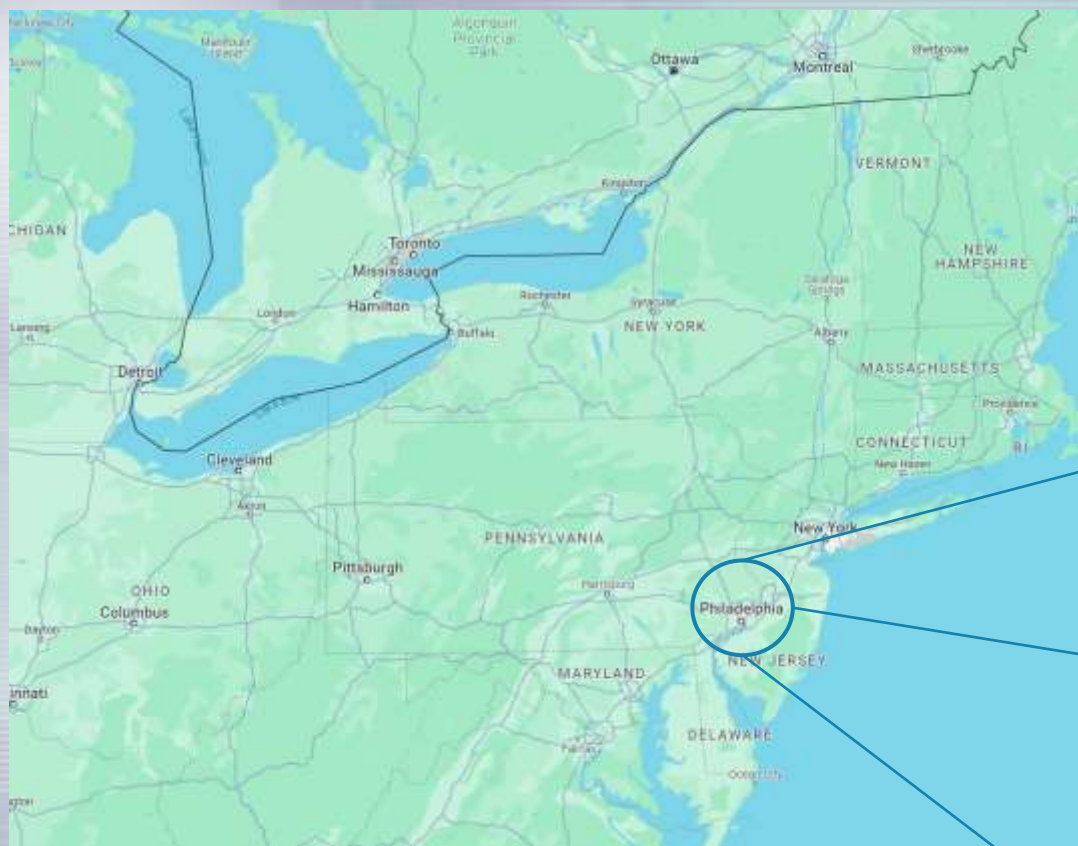


# TRAILS IN THE AGE OF CLIMATE CHANGE

Disaster Management in Philadelphia

Presentation by: Joshua M. Bell, Operations – Philadelphia Parks & Recreation

# Context



- 1: Schuylkill River Trail (SRT)
- 2: Manayunk Canal Trail
- 3: Wissahickon Forbidden Trail





Photo Credit: Thom Carroll/Philly Voice



Photo Credit: Valley Forge Tourism & Convention Board



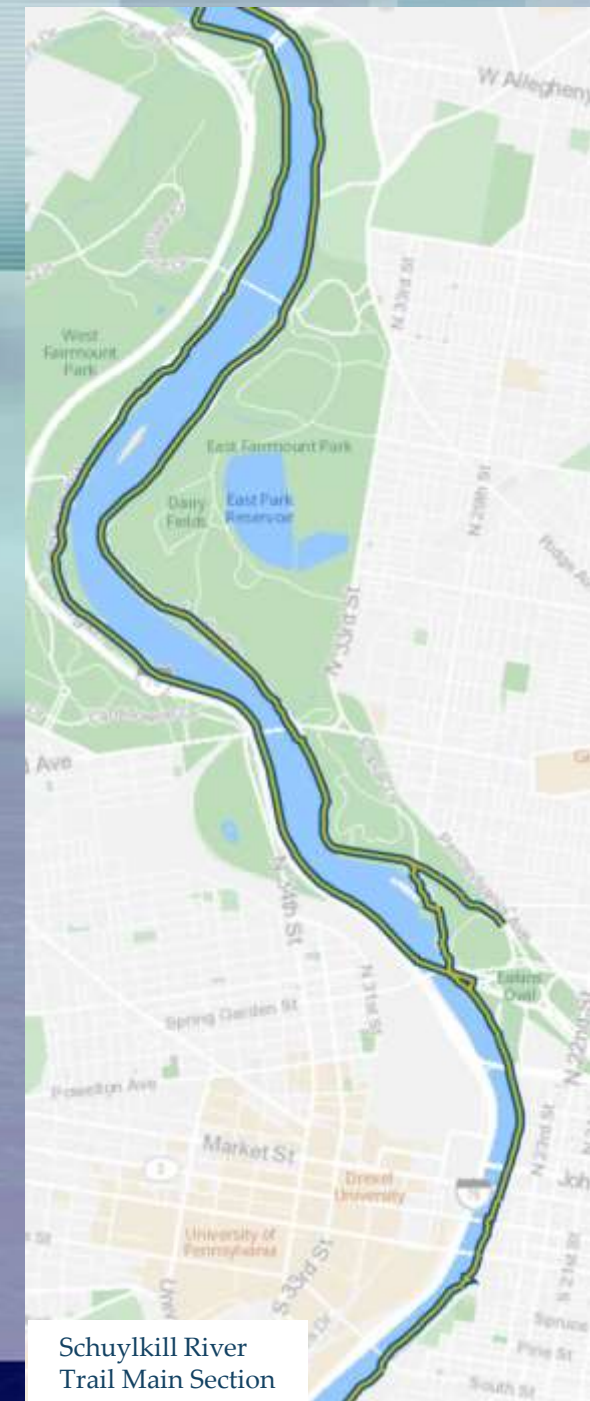
Photo Credit: [Skateboard Blog](#)



Photo Credit: Drexel University Admissions



Photo Credit: Visit Philadelphia Schuylkill Regatta



Schuylkill River Trail Main Section

# Past Major Storm Impacts

- Severe Thunder Storm (06/2015)
- Snow Storm Jonas (01/2016) = \$6,906,791.25
- Derecho Event (06/2020) = \$969,007.00
- Storm Isaias (08/2020) = \$2,888,532.00



Photo Credit: Ms. Lori Hayes, Director of Urban Forestry



Photo Left  
Credit: The  
Weather  
Channel



Photo Right  
Credit: NBC  
News

# Hurricane Ida (9/1/2021)– Impacts

- 5-10" of Rain
- 7 Tornadoes
- Schuylkill Crest at 16.35 feet



Manayunk Canal Trail



Photo Credit: AccuWeather



Photo Credit: Matt Rourke, AP News

# Hurricane Ida (9/1/2021)– Impacts

- 32 PPR Locations Affected
- Initial Estimate = \$20,202,563.13
- Adjusted Cost = \$5,202,563.13
- Total Reimbursable = \$1,052,540.00

Location (Name)	Location Address	Contact	Damage Type	Damage Description*	Repair or Replacement Cost Estimate/Quote **	Completion %	Private Insurance Available	Overtime Incurred***	Outside Contractor?
National Racecourse Finish Tower	Grandstand at Peters Island	Tom Forkin	Severe Damage	Gate and Window Repair, Silt Removal	\$175,000.00	100%	No		
Cohocksink Rec Center		Lauren Hunt	Affected	Dance Room Closet -Roof leaked - ceiling tiles dropped and water accu	\$25,000.00	?	No	No	No
Scuykill River Wall	From boathouse Row to Hunting Park	Aparna Palantino	Severe Damage	Need to assess and restabilize (assuming 50% of approx 11,000LF ) from	\$15,000,000.00		No	Yes	Yes
Schuykill River Wall Inspection	Schuykill River Wall Emergency Inspection SCOPE	Tom Spokas	Severe Damage	Pennoni Associates is getting together a team for in-depth inspections	\$50,780.84	75%	No	No	Yes
Kelly Drive Stone Wall Repairs				Repair damaged sections of stone wall along Schuykill at Kelly Drive sec	\$123,000.00	50%	No	No	Yes
Waterworks	640 Waterworks Drive	Aparna Palantino	Severe Damage	Fire Alarm system, Fire pump, elec panels, elevator, HVAC, Interior finis	\$1,815,000.00	?	No	No	Yes
East Park Canoe House	2200 Kelly Drive	Tom Forkin	Destroyed	All docks listed out below, See Northeast Dock Proposal for quote	\$325,000.00	100%	No	No	Yes
City Dock	Downriver from 2200 Kelly Drive	Tom Forkin	Destroyed	160' Dock and 2 Ramps Destroyed	\$325,000.00	25%	No		
Fairmount Park Guard House	2200 Kelly Drive	Tom Forkin	Destroyed	Historic Guard House Swept Away and Destroyed	\$40,000.00	0%	No	Yes	
Fairmount Park Police Ramp	Public Lot Between 2100 and 2200 Kelly Drive	Tom Forkin	Affected	Metal Grating Compromised, Needs Evaluation and Potential Repair	\$50,000.00	0%	No	Yes	
Fairmount Park Police Ramp	Public Lot Between 2100 and 2200 Kelly Drive	Tom Forkin	Destroyed	Safety Railings and Posts	\$50,000.00	0%	No	Yes	
Strawberry Mansion Marina	Downriver from Strawberry Mansion Bridge	Tom Forkin	Severe Damage	Pilings Damaged (1 Destroyed), Unknown Damage to I-Beams, Destruct	\$300,000.00	0%	No		
Safety Line Wire Repair	Spans River at Boathouse #6	Stephanie Craighead	Severe Damage	Line with 25 perpendicular ropes destroyed, the total cost for repair, re	\$268,575.00	0%	No	No	Yes
Old Safety Line Wire Recovery	In river at Boathouse #6	Tom Forkin	Severe Damage	Recovery of old line that broke I-beam on West side done by AP	\$20,127.00	100%	No	No	Yes
National Racecourse Grandstand	Grandstand at Peters Island	Tom Forkin	Severe Damage	Tree removal, Railing replacement, Bench replacement, and clearing	\$250,000.00	50%	No		
Three Angels National Course Ram	Kelly Drive + Fountain Green Drive	Tom Forkin	Destroyed	Cement-moored dock stays bent and/or washed out.	\$45,000.00	100%	No		
Lloyd Hall Ramp	#1 Boathouse Row	Tom Forkin	Affected	Stress to Hinges and Tethers requiring inspection and repairs	\$42,000.00	?	No	No	Yes
Lloyd Hall Dock	#1 Boathouse Row	Tom Forkin	Affected	Damage to flotation, surface boards, etc. Requires inspection and repai	\$80,000.00	?	No	No	Yes

Waterworks Exterior



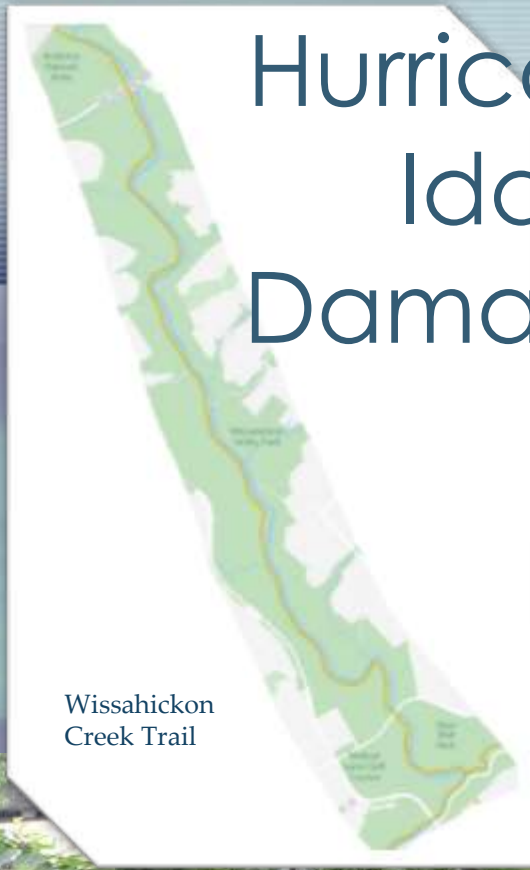
Waterworks Interior



# Hurricane Ida Damages



Markward Playground



# Hurricane Ida Damages

Wissahickon  
Creek Trail

Wissahickon Trail



Manayunk Canal Trail

# Debris Management

- 860 Cubic Yards, Silt & Vegetative Debris
  - ~1204 tons
- Organic Recycling Center
- Replaced 855 Tons of Stone
  - Force Account work over contractor
  - Saved Department \$300K+



# Funding - Lessons Learned Prior to Ida

- Keep Good Records
- Fold in Fringe Benefits to Calculations
  - $$=((\text{HoursWorked} * 0.4297) * \text{HourlyRate})$$
  - $$=(\text{OvertimeCost} * 0.11953)$$
- Expand Cost Tracking Sheet





# FEMA Funding – If We Only Knew

- Full Understanding of Labor Types
  - Worked with FA – Force Account
- DR – Donated Resources
  - Receipts, Worker Logs
- C – Contracted
  - Public/Private Partnership



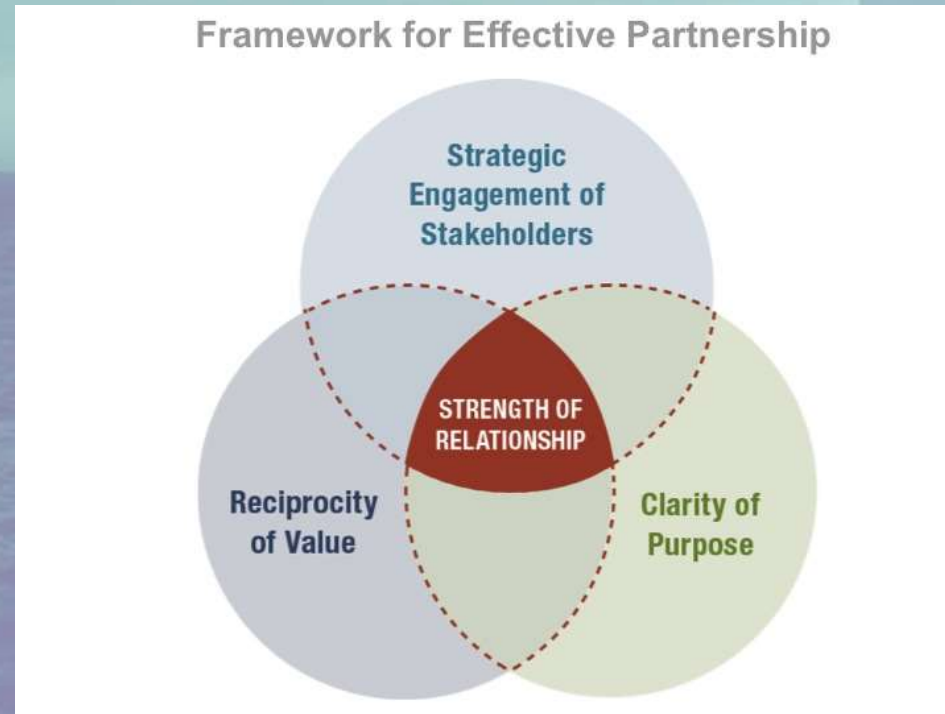
# Safety Cable Streets & PPR Partnership

- ◎ PPR Removed Old Broken Cable, Jan 2022
  - \$20,127.30
- ◎ Emergency WO Handled by Streets, Jan 2023
  - \$268,575.00



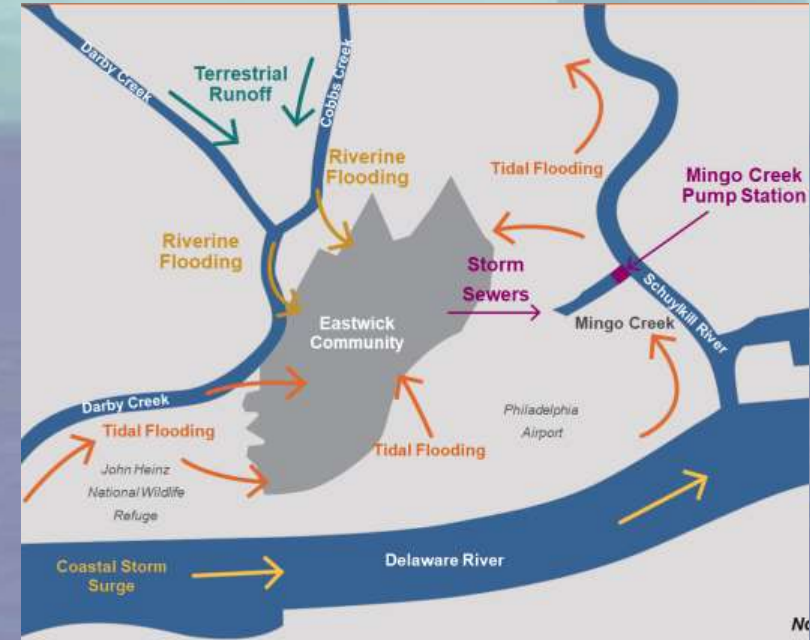
# Keys to Successful Partnership

- ⦿ Keeping Lines of Communication Open
- ⦿ Be Flexible
- ⦿ Lean on Expertise



# Thoughts on Resiliency

- Hard for Governments
- Hesco Barriers – Eastwick Regional Community



- Office of Sustainability : FRMTF

# Lied Bridge Reconstruction Following 2019 Flooding

Repairs following historic damage from climate change caused snow melt and rapid warming in the upper Platte River watershed

Eric Williams

Natural Resources Planner

March 26, 2024



**PAPIO**  
MISSOURI RIVER  
NATURAL RESOURCES DISTRICT

# Nebraska NRD History

- 23 Natural Resource Districts (NRDs)
- Created in 1972 from
  - county soil and water conservation districts
  - drainage districts
  - watershed boards
- Papio and Missouri Tributary merged in 1989



# NEBRASKA'S NRDS

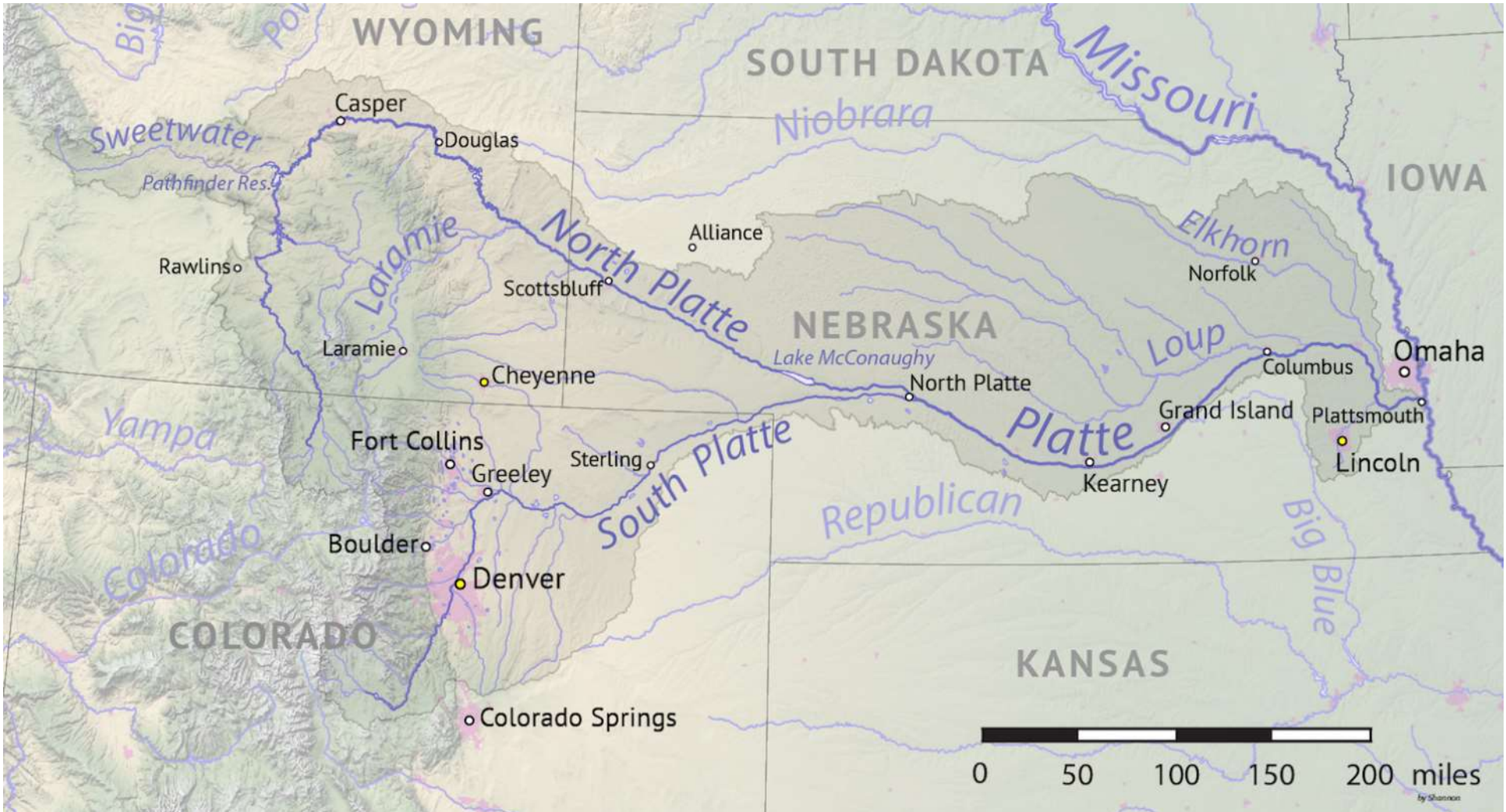
23 Natural Resources Districts Established Along River Basins







# Platte River Watershed



# March 15 – 17, 2019 Flooding



# Post-Flood Bridge and Trail Damage



# Debris Removal



# Ice Breaker Sub-Structural Repair



# Railing Super-Structure Repair



# Trail, Crushed Limestone Surface - Before



# Trail Re-alignment and Reconstruction





# Trail Re-alignment and Reconstruction

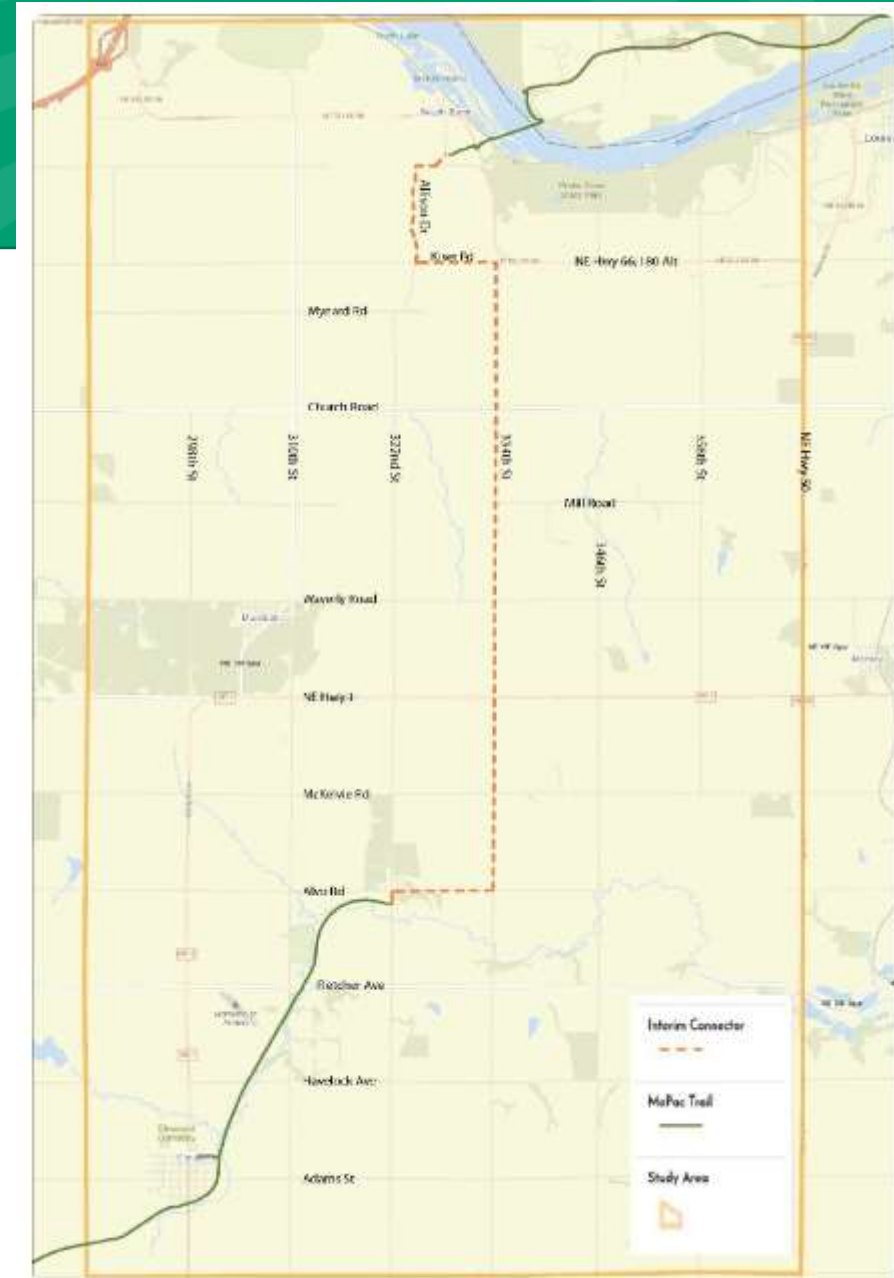


# MoPac Trail & Lied Bridge Re-Opening !!



# Trail Operations Resume

- Funding from FEMA for all 4 projects
- Market to Market Relay 2020 and onward
- Expanded public space
- Funding to connect the missing 8-mile gap in the MoPac Trail from the Lied Bridge toward Lincoln, NE



# Preparing for future climate-caused events

- Increases in temperature increase the likelihood of severe storms
- Understanding the potential impacts is critical during design
- Careful planning can accommodate natural events, while helping people enjoy recreation, active transportation, and access to natural resources from trail systems

# Happy Trails to Everyone !!



# The Elroy-Sparta State Trail

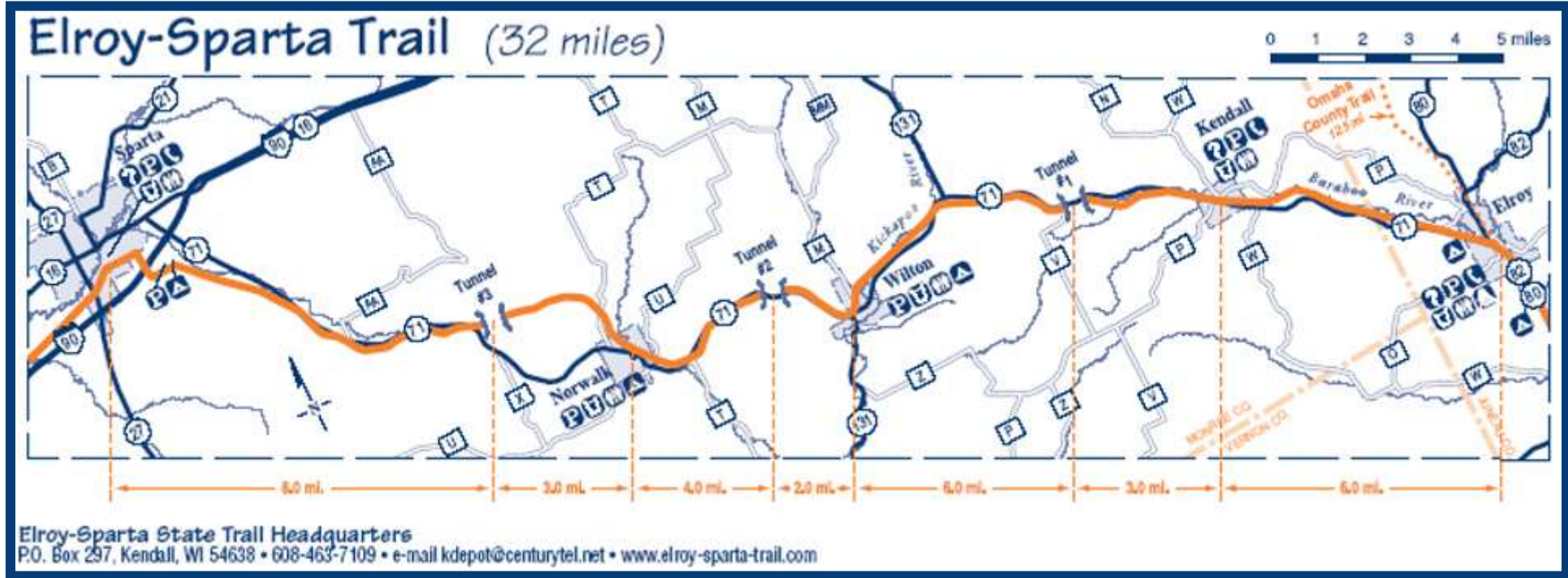
## Assessment and Repair after historic flood of 2018

Andrew Haffele – Superintendent -Wildcat Mountain State Park -Bureau of Parks and Recreation Management -WI DNR

Missy VanLanduyt -Section Chief -Recreation Partnerships, External Relations and Communication– Bureau of Parks and Recreation Management, WI DNR



# Elroy-Sparta State Trail





# Elroy-Sparta State Trail Facts

- First Rails-to-Trails project in the USA!
- 32 miles long trail passing through 5 rural communities
- Now part of 4 connected State Trails extending over 100 miles
- Railroad originally built in 1873
- Converted to State Trail in 1965
- 3 tunnels to travel through
- 60,000+ annual visitation
- Multi-use trail including biking, hiking, snowshoeing, cross-county skiing, snowmobiling



# Wisconsin Natural Disaster Statistics

- 8 declared disasters since 2013
- Estimated amount in damages exceeds \$11 million on state owned lands
- Includes trails, roads, culverts, bridges and water control structures
- Generally rain event declarations
- 68 individual projects on 58 properties



# Wisconsin/Mid-West Disaster Trends

- More volatility in weather events and patterns
- More extremes; more often
- Smaller events that don't meet declaration thresholds
- Snow/freeze, wind, tornado, dry/fire other events becoming more common
- Generally western Wisconsin for rain events; eastern for wind events
- Issues with size and condition of water control and travel infrastructure



Photo: Elroy-Sparta State Trail covered in downed trees from August 2021 Tornado

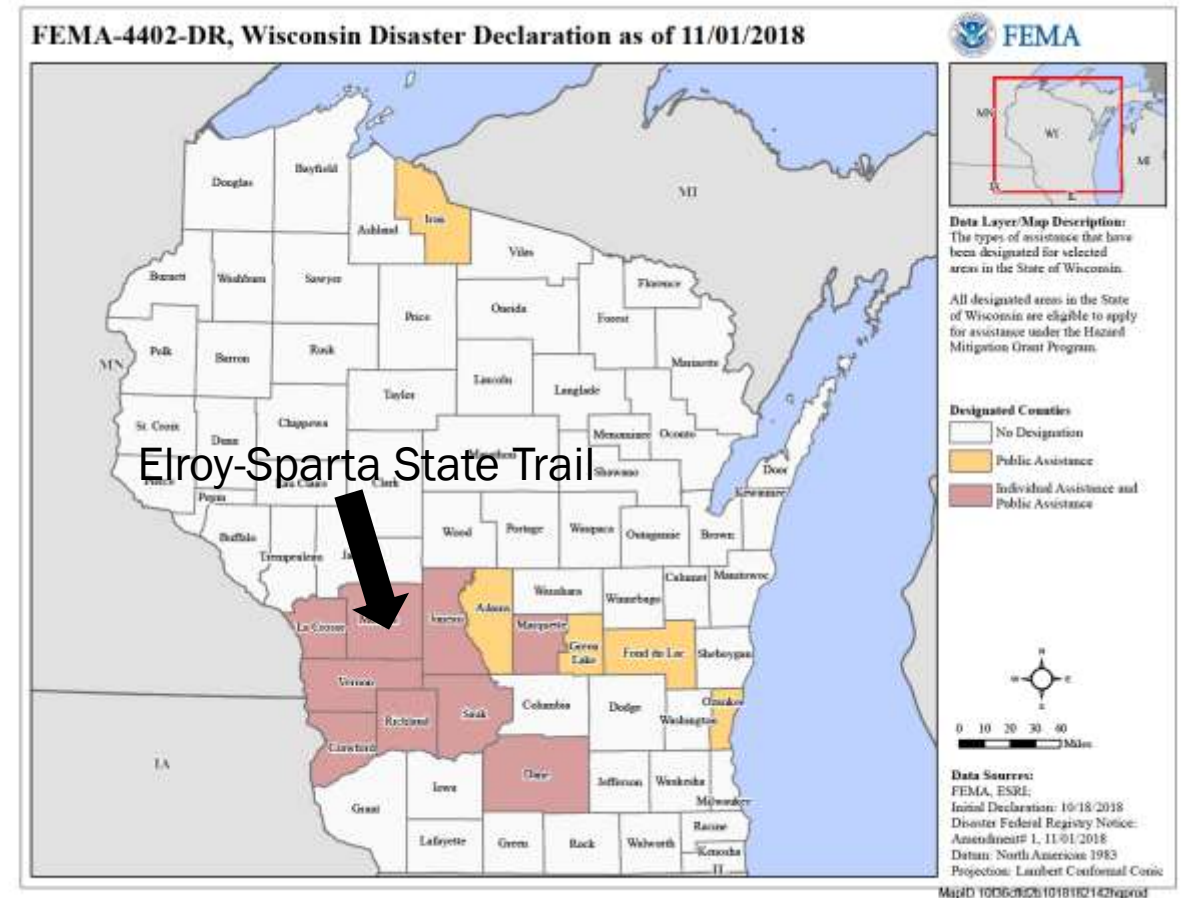
# Federal Disaster Trends We See In WI

- More disaster declarations take place in coastal states; WI low population comparatively
- Band aide approach to infrastructure replacement – in-kind
- Difficulty with improved projects, hazard mitigation, timelines, funding, federal approvals etc. – CHALLENGES
- Climate change, community development and investment in infrastructure play a role



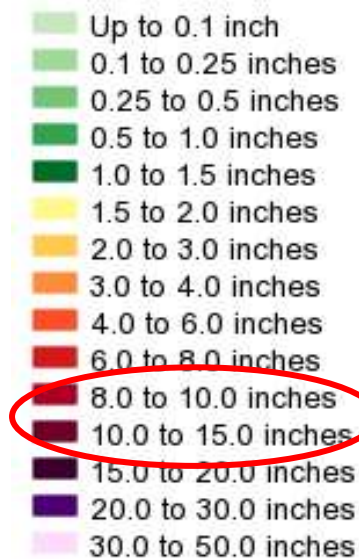
# Record flooding in 2018

- August 17-September 14, 2018
- Heavy rains, severe storms, tornadoes and strait line winds affected most of southern Wisconsin
- FEMA 4402 Disaster Declaration issued by President Trump on October 18, 2018.
- \$37.2 Million in Public Assistance Grants issued
- \$13.5 Million in Individual assistance issued



# Elroy-Sparta State Trail severely damaged by heavy rains and flooding

- The trail lies in the area that received the most rainfall
- Most of the trail received between 4” to 15” of rain in 1.5 days



Graphic Created  
August 30th, 2018  
11:12 AM CDT

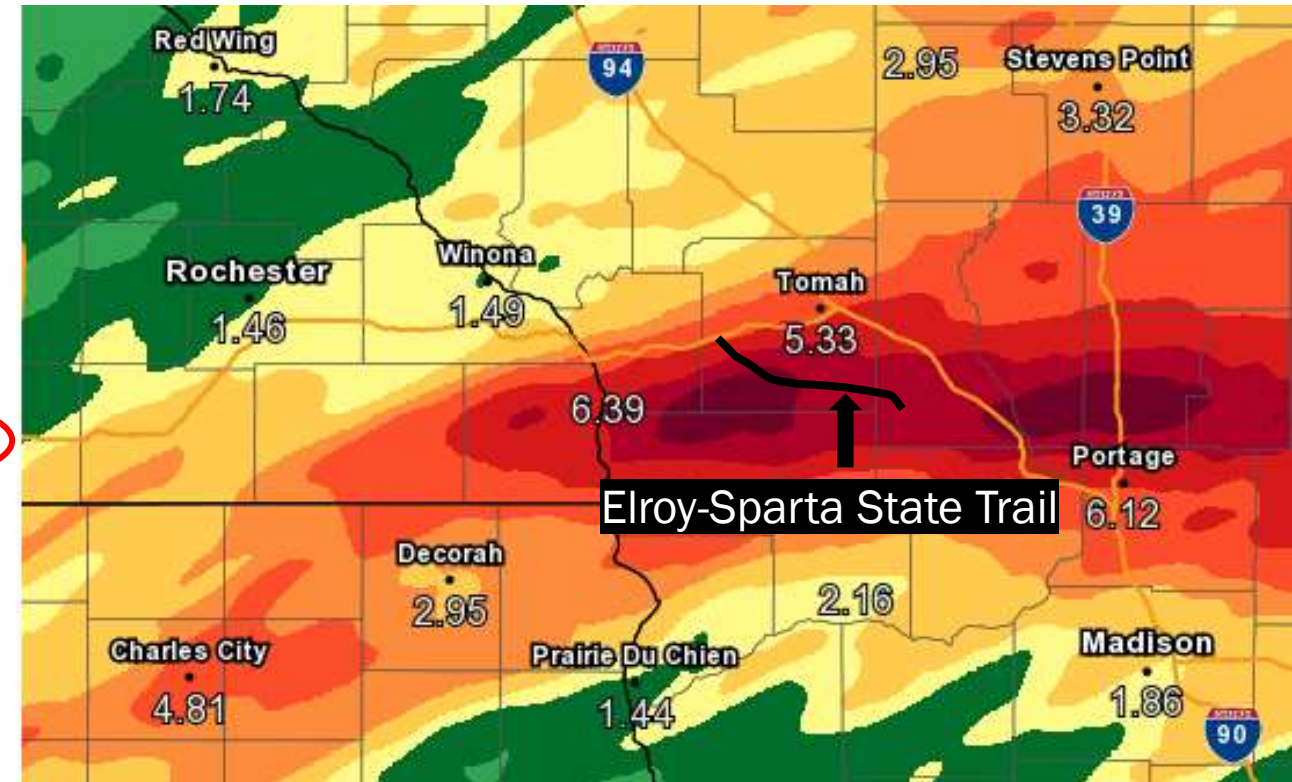
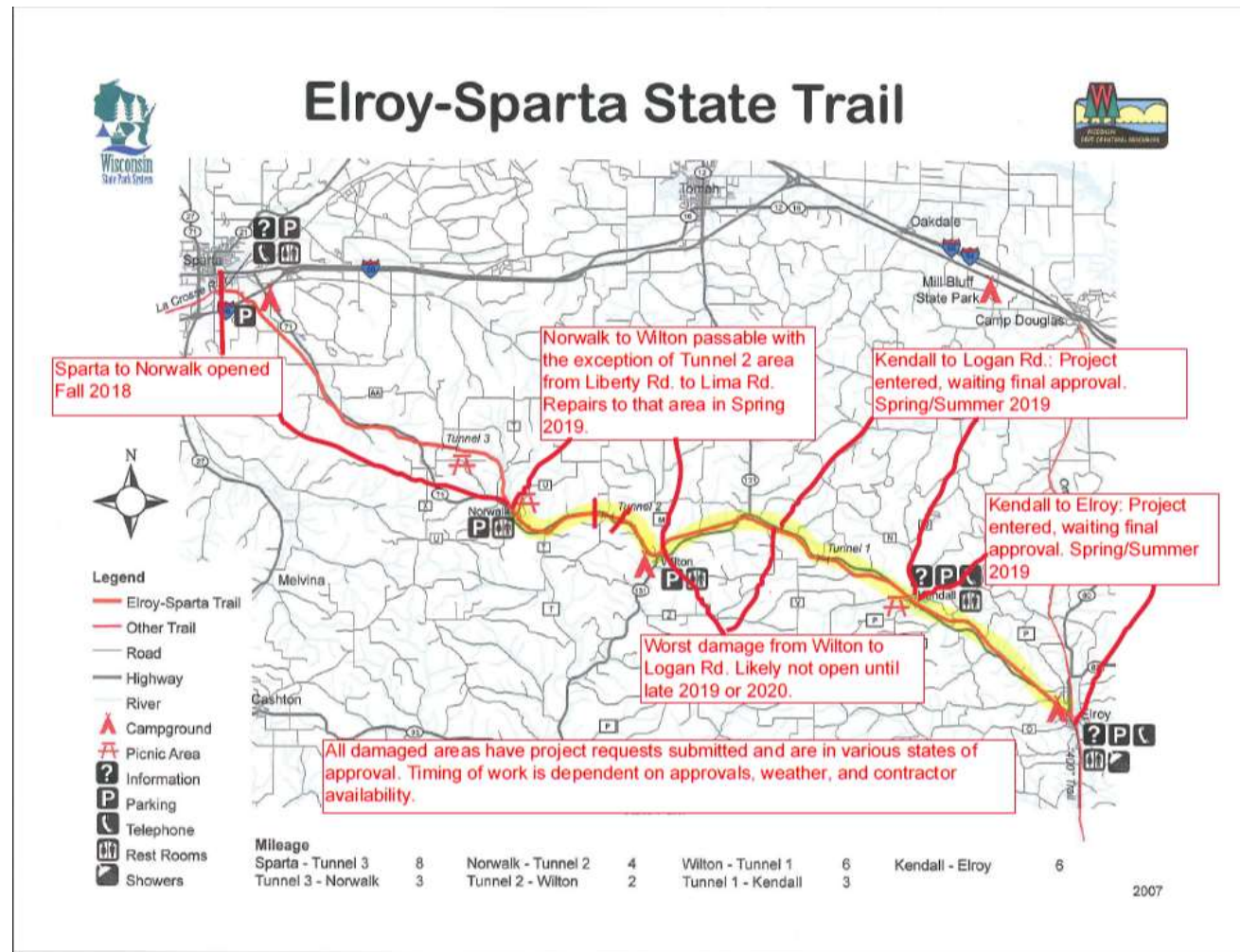


Photo credit: National Weather Service, weather.gov

# Impacts of the 2018 flood on the Elroy-Sparta State Trail

- Over 22 miles of the trail damaged, most significantly between Norwalk and Elroy
- 3 trail washouts next to Kickapoo River
- 4 slope failure/landslide areas
- Major bridge and culvert washouts and damages
- Repair project cost approximately \$2 million



# Slope Failure





# Trail washouts



# Bridge Abutment Failure



# Debris Blocking the Trail



# Flood Response

- Human health and safety primary concern. Immediately closed the entire trail until inspections could be completed
- DNR Parks and Engineering staff conducted rapid assessments and preliminary cost estimates to assist Wisconsin Emergency Mgmt. with disaster declaration decision.



# Flood Recovery on the Elroy-Sparta State Trail

- Parks staff quickly made necessary repairs to re-open a few sections of trail in Fall 2018
- Created project proposal for larger, more expensive repairs
- KL Engineering was hired to conduct in-depth inspections and complete pre-design to develop scope for final design



# Flood Recovery

- Project design and cost estimates completed
- Unique project consisting of 28 sites over 22 miles of trail
- Project presented to Wisconsin State Building Commission for funding approval
- Project sent out for bids

- Significant delay because bids came back much higher than expected
- Project brought back to State Building Commission for additional funding
- Contract awarded and work began in December 2020
- Project was completed in December 2021

# Funding Flood Recovery Projects

- Natural Disasters are reimbursable
  - Through determination phase and until projects are complete
  - Thresholds for direct pay versus reimbursable are changing
  - Minimum eligibility thresholds are increasing/changing
- Work through WI Dept of Administration (DOA) to execute projects
  - Pay design and administration fees
  - Generally it takes several years to execute projects
  - Estimates vary largely between DOA and FEMA

# Before and After





# Before and After



# Before and After



# Building resiliency for future events



- Additional armoring and protection added in strategic locations

# Building resiliency for future events

- Bridge elevation raised to achieve more clearance above base flood elevation
- Built with heavy loading capabilities for future maintenance and repairs to the trail



# Lessons Learned

- Communication is vitally important
- Don't forget the public is the primary stakeholder, keep them informed as much as possible
- Expect delays
- Be flexible and adaptable as much as possible
- Document everything



# Q&A



**Joshua Bell**

Operations Manager, Operations  
& Landscape Management,  
Philadelphia Parks & Recreation  
[joshua.bell@phila.gov](mailto:joshua.bell@phila.gov)



**Eric Williams**

Natural Resources Planner,  
Papio-Missouri River Natural  
Resources District  
[ewilliams@papionrd.org](mailto:ewilliams@papionrd.org)



**Melissa Vanlanduyt**

Recreation Partnerships Section  
Chief at Wisconsin Department of  
Natural Resources (DNR)  
[Melissa.Vanlanduyt@wisconsin.gov](mailto:Melissa.Vanlanduyt@wisconsin.gov)



**Andrew Haffele**

Superintendent of Wildcat  
Mountain Work Unit, Bureau of  
Parks and Recreation  
Management, Wisconsin DNR  
[andrew.haffele@wisconsin.gov](mailto:andrew.haffele@wisconsin.gov)

# Upcoming Events:

4/27 Celebrate Trails Day

## WEBINARS AND ONLINE DIALOGUES:

4/23 – Trail Funding Unpacked: Navigating Federal Resources for Sustainable Maintenance

6/11 - Overcoming Barriers: Innovative Practices to Securing Federal Funding

6/26 - Safety First: How to Effectively Demonstrate Safe Outcomes in Grant Applications

7/31 – Resources for Improving Accessibility on Multi-Use Trails

Join the TrailNation Collaborative!



Thank you!