



# Working Together: Improving conditions for natural resources and infrastructure in Massachusetts

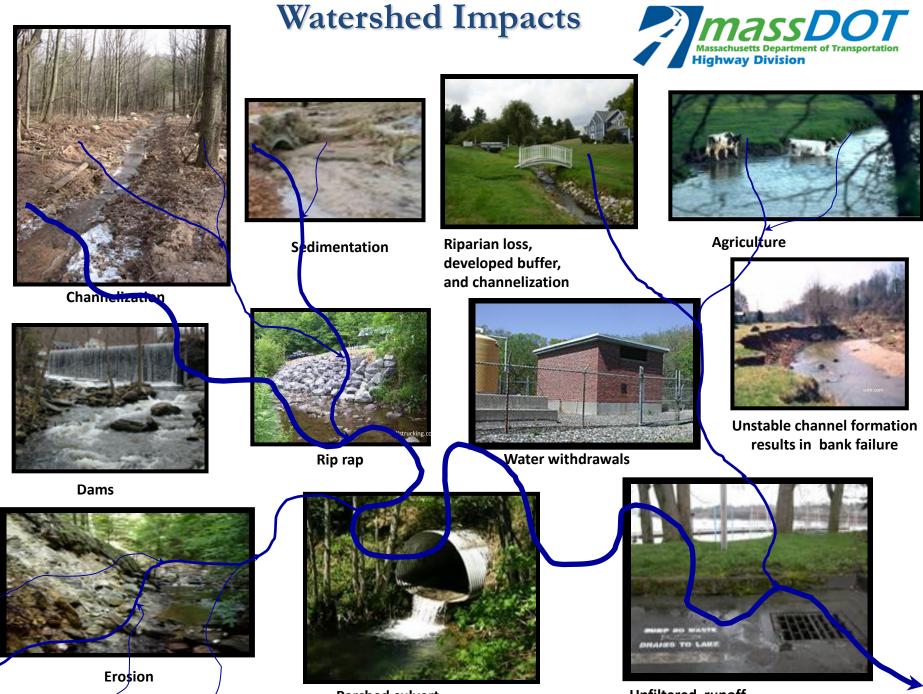
## Northeast Transportation & Wildlife Conference 2016

September 12, 2016

Tim Dexter, MassDOT Highway Division David Paulson, MassWildlife NHESP

# Interdepartmental Service Agreement

Established December 2008 3 Year Agreement Purpose Streamline the regulatory review process pursuant to the Massachusetts Endangered Species Act Accelerated Bridge Program 250 structurally deficient bridges over 8 years Renewed December 2011 Funded Linking Landscapes



**Perched culvert** 

Unfiltered runoff

#### Watershed Restoration

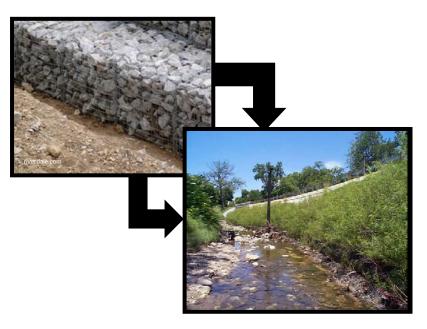


#### **Presentation Overview**



- Fluvial Geomorphology
- Bioengineering
- Coarse woody debris
- Stream Crossings
- Slope stabilization
- Example projects







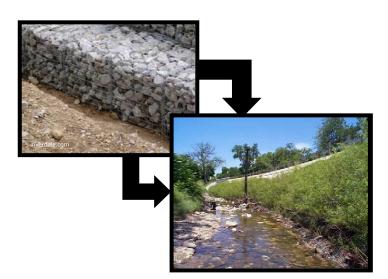
- Fluvial Geomorphology ("FGM") The science of understanding river and stream-channel responses to both human-induced and natural disturbances.
  - Predict stream channel responses to alterations in a watershed, and in turn how these changes will impact human infrastructure and aquatic habitat.
  - Multidisciplinary engineering, biology, geology, earth science, hydrology, hydraulics.
- Soil Bioengineering ("Bioengineering") The use of plant material, living or dead, to alleviate environmental problems such as shallow, rapid landslides and eroding slopes and stream banks.
  - Multidisciplinary soil science, botany, hydrology, engineering, geology.

#### FGM & Bioengineering Considerations



Encourage project proponents to think holistically about the problem – What is happening at site, reach and watershed levels that may be influencing the problem?

- Consider the system and it's dynamics
  - Sediment size, stream slope, stream flow, stream crossing and floodplain restrictions, surrounding infrastructure, etc.
- Reassess conventional techniques (i.e. Rip Rap, Concrete, Gabion Baskets)
  - Feasible to mimic natural channel, bank, floodplain features & processes?
  - Risk assessment: public safety, adjacent properties, infrastructure.
  - Combination of the two?





# **Bioengineering BMPs**

- Coir fascines / logs
- Brush mattresses & revetments
- Unanchored and Anchored Rootwad revetments
- Brush layer benches
- Geotextile "vegetated reinforced soil slopes" using, to the greatest extent feasible, biodegradable materials that are unwelded/unknotted
- Loam & seeding, and interstitial planting of rock embankments
- Submerged shelters (whole trees/tree tops/boles/brush piles)
- Boulder clusters/"In-stream Boulder Dissipaters"
- Boulder deflectors
- Random boulder placements that are mobile & deformable









#### FGM & Bioengineering Benefits

#### Site & Reach Level

- Habitat restoration
- Bank stabilization
- Diffuse energy
- Trap & Manage sediment load
- Shift thalweg away from infrastructure
- Reduced maintenance and repair

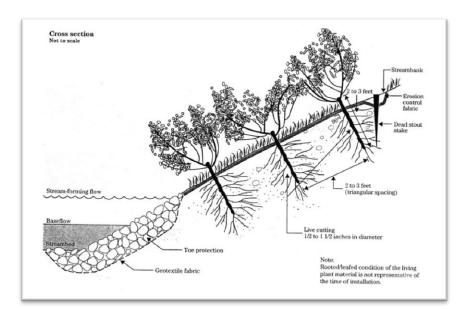
#### <u>Watershed</u>

- Reduced cumulative impact
- Increased resiliency to climate change

#### <u>Project</u>

- Streamline permitting (MESA/WPA/401/404)
- Funding opportunities
- Win–Wins (ex: resilient roads flood protection – habitat)







#### Example of Historic Land Clearing





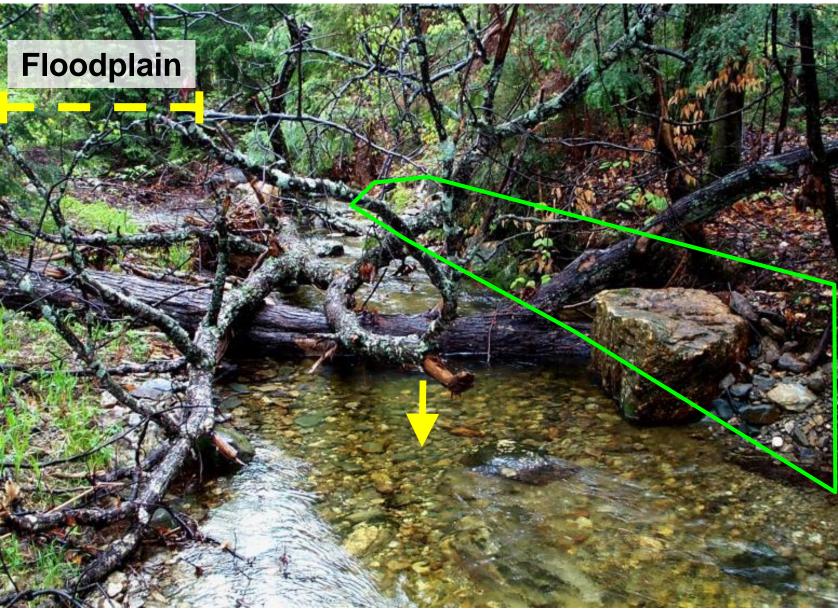
### **Coarse Woody Debris**



- Fish habitat
- Stream channel & bank stability
- Biological diversity

## **Coarse Woody Debris for Stream Channel Stabilization**





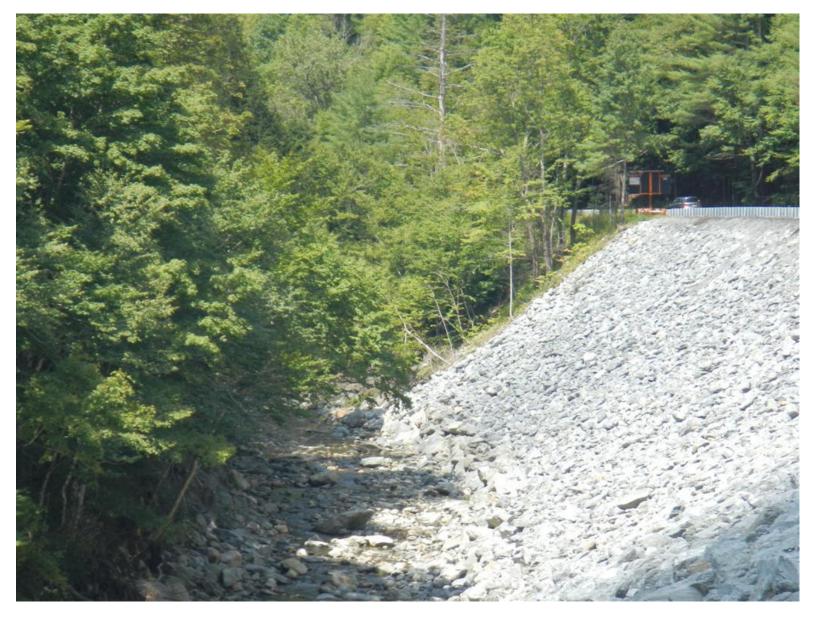
## "Chop and Drop"





#### **Alternatives to Rockfill Slopes**





### **Reinforced Vegetated Slopes**







### **Vegetated Rockfill Slopes**





#### Stream Crossings: Design for Fish/Wildlife <u>and</u> Severe Storm Resilience











#### Stream Crossings: Design for Fish/Wildlife <u>and</u> Severe Storm Resilience































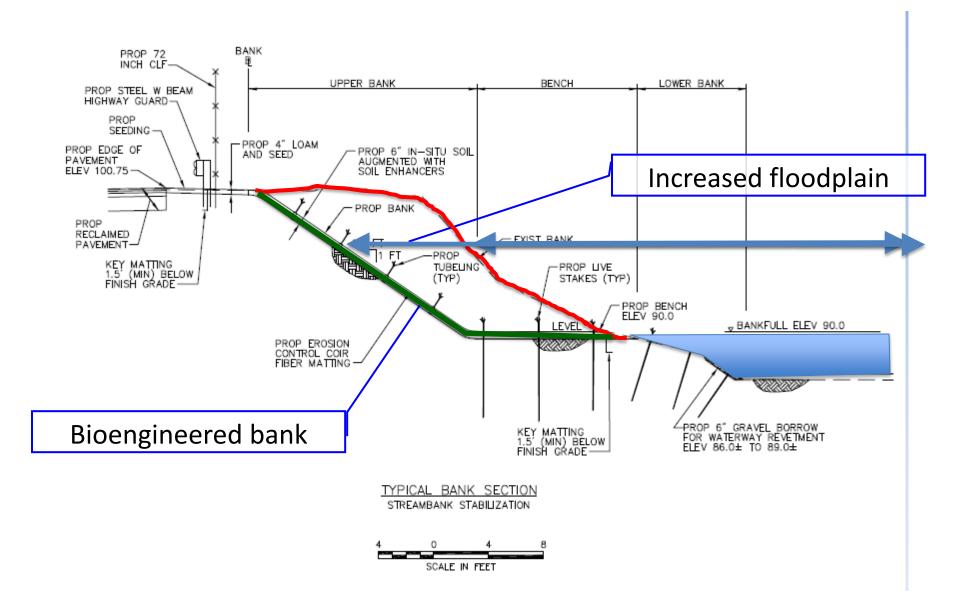


- Eroding stream bank
- Salt facility ~36' from bank
- Pavement undercut
- Asphalt from parking area falling into river

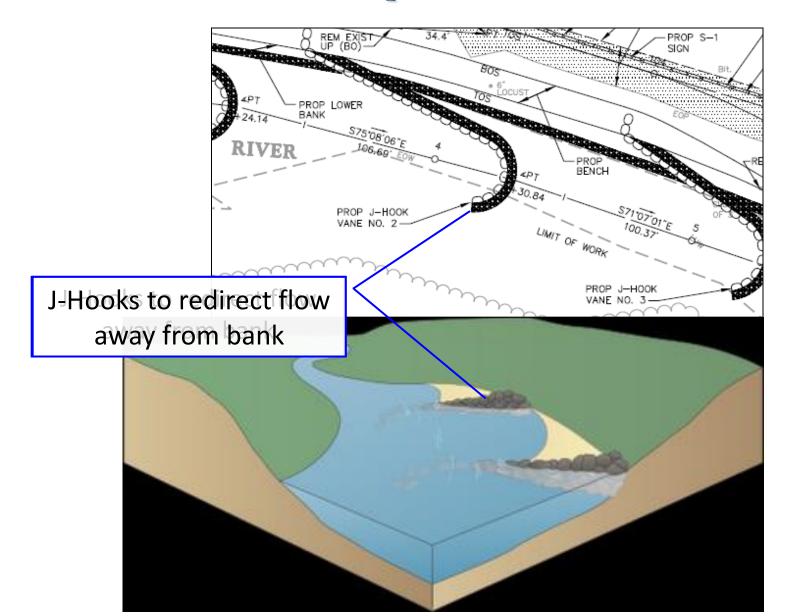








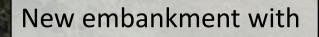












increased floodplain

Little River

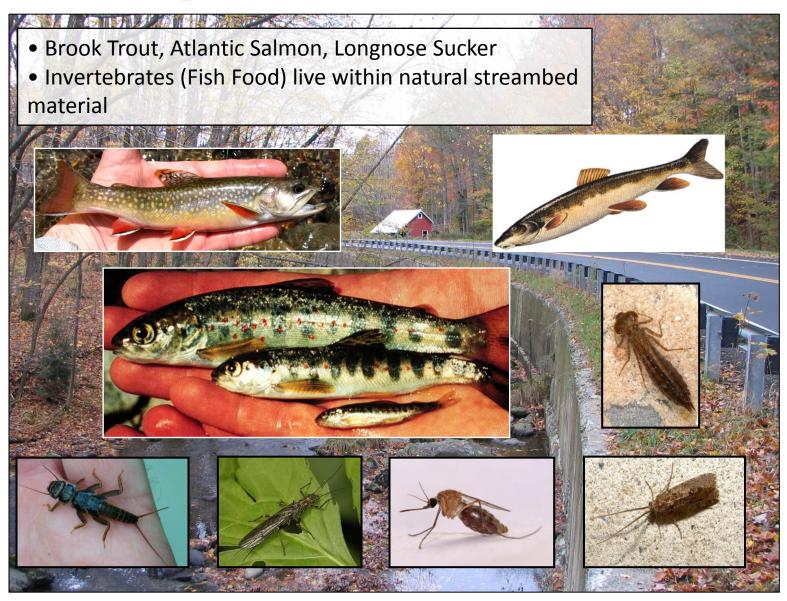
Little River



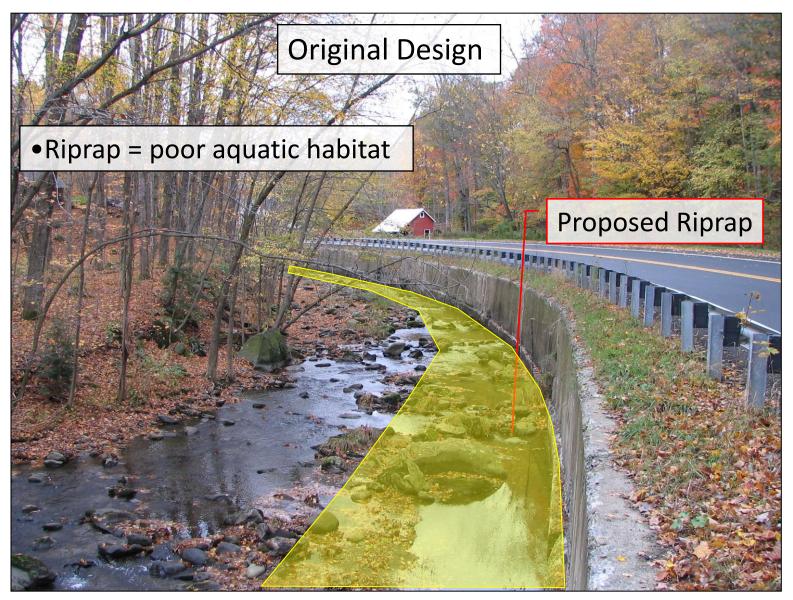
- Extensive Scouring
- Deteriorated retaining walls
- Threatens integrity of Route 116
- Cold water fishery



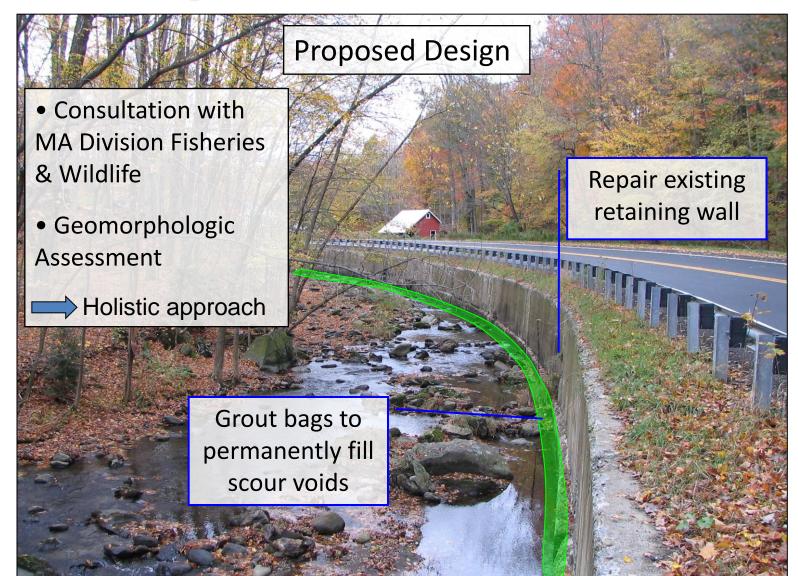




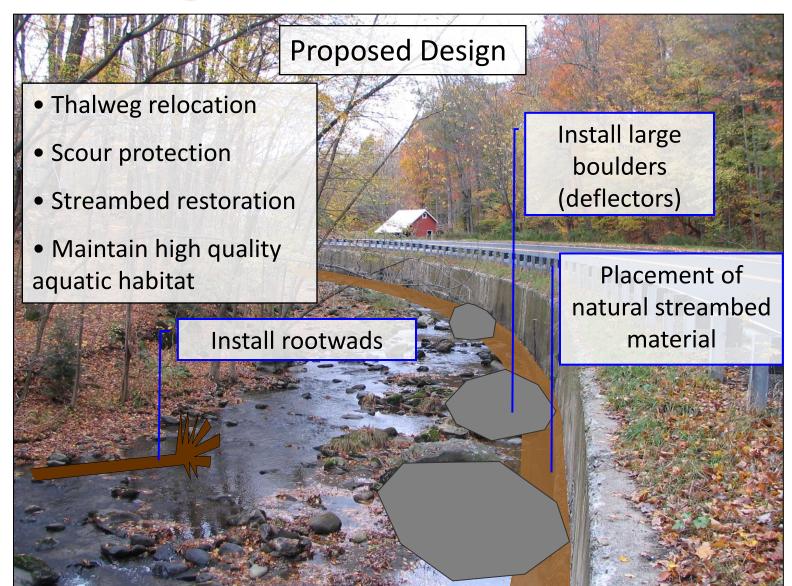


























#### Valley Constriction

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Confluence

South River

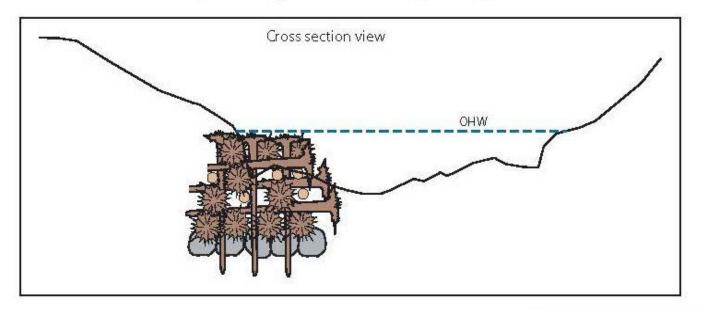
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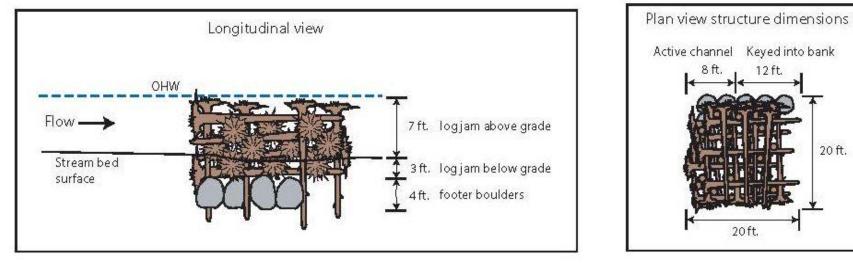
Confined Valley Width



20 ft.

Conceptual design schematic - marginal log jam



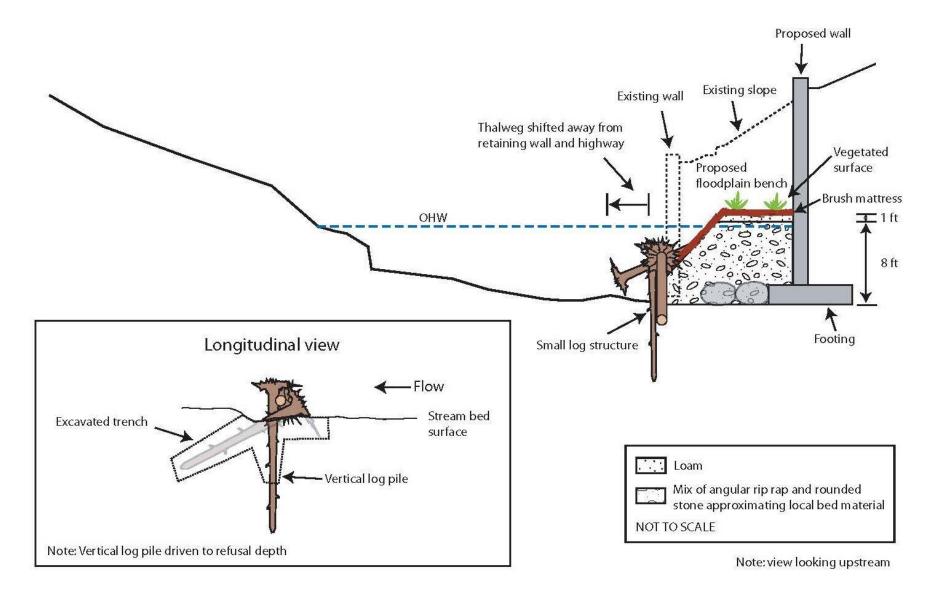








Conceptual design schematic - cross section view









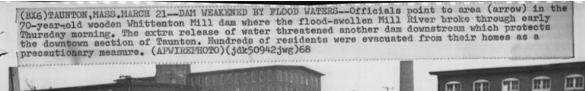


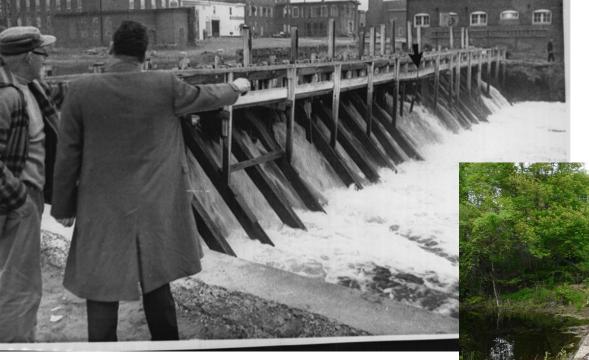




## Dam Removal: Fisheries/Ecological Restoration <u>and</u> Public Safety









#### Whittenton Dam Removal Pre/Post





# Dam Removal "Low Hanging Fruit"







Oxbow Brook, Rowley, MA

#### Relationships



Early Coordination / Collaboration
Develop proactive programs; foster local, regional & state-wide partnerships







#### **Contact:**

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