NRRI Stormwater Master Plan

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Project Summary

Stormwater Management

- Reduce runoff from impervious surface
- Create “living labs” to educate
- Protect Miller Creek headwaters

Native Plantings

- Provide habitat for pollinators
- Lower carbon footprint
- Create natural wind break

Energy Efficiency

- Lower heating costs
- Reuse and capture water

Issues Addressed

Protecting Miller Creek

- Reduce thermal/particulate pollution
- Slow down/cool runoff and increase groundwater recharge
- Create natural habitat surrounding headwaters

Expanding Educational Opportunities

- Creating living labs
- Provide public educational resource

Energy Use

- Lower heating costs
- Reduce municipal water consumption

Stormwater Master Plan

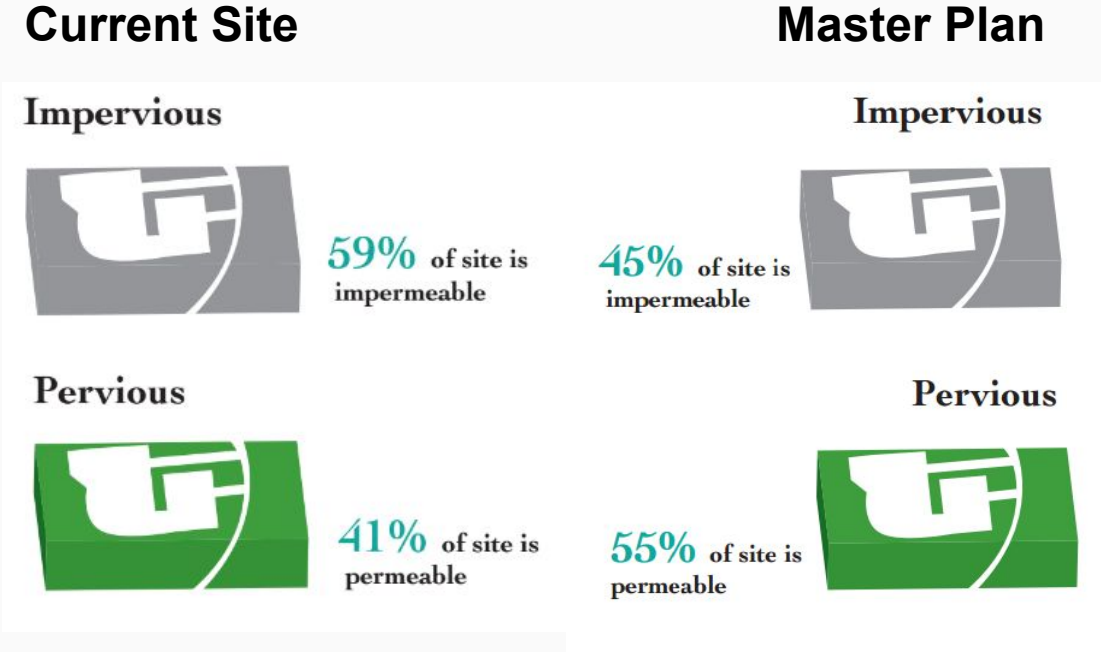
1. Extensive Green Roof
2. White Roof
3. Rainwater Harvesting
4. Existing Sewer System
5. New Sewer System
6. J-Spouts
7. Taconite Path
8. Bioswale
9. Cistern
10. Removed Parking Lot
11. Windbreak Trees
12. Constructed Wetland
13. Removed Entrance
14. Removed Entrance

Protecting Miller Creek

Impervious Surface Removal

Reasons:

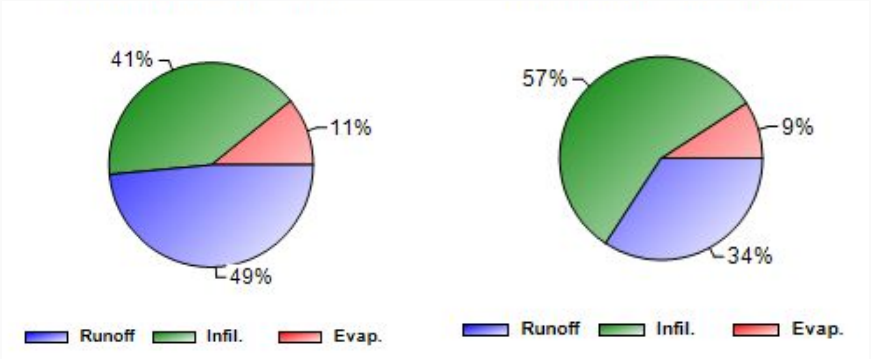
- Reduce and slow runoff
- Promote infiltration
- Pollutant removal
- Groundwater recharge



Wetland Construction

Reasons:

- Native habitat near headwaters
- Increase groundwater recharge
- Reduce thermal pollution
- Water filtration and retention



Current Site

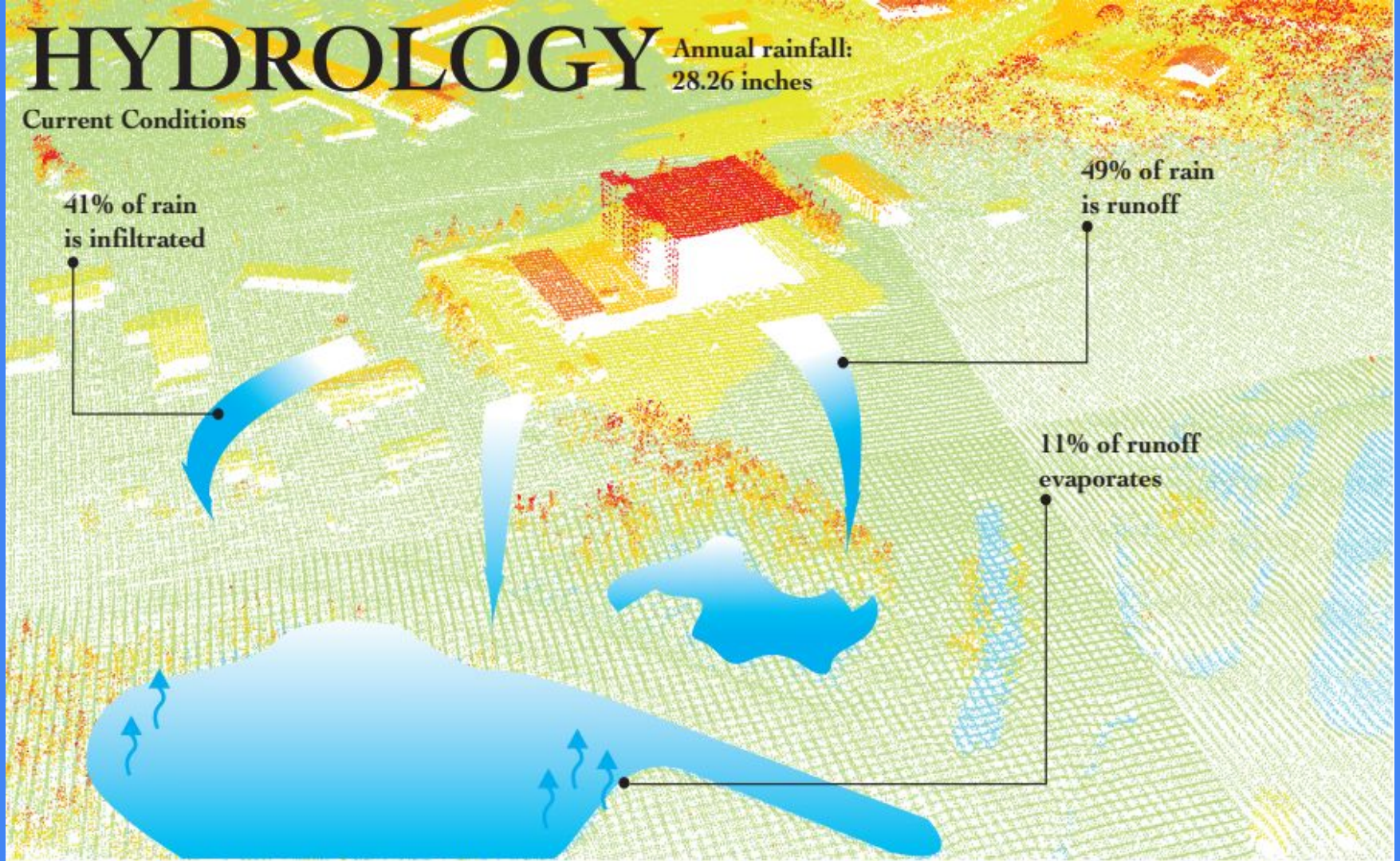
Master Plan

Data calculation performed using
the EPA Stormwater Calculator

HYDROLOGY

Annual rainfall:
28.26 inches

Current Conditions



Expanding Education Opportunities

Taconite Path

Educational Capabilities:

- Showcase innovative porous pathway
- Utilizing regional products

Additional Advantages:

- Filtering and cooling stormwater
- Low maintenance

Bioswale

Educational Capabilities (Living Laboratory)

- Research various media/substrates
- Showcase green infrastructure
- Hands on engagement

Additional Advantages:

- Add aesthetic value
- Slowing, cooling, and infiltration of stormwater

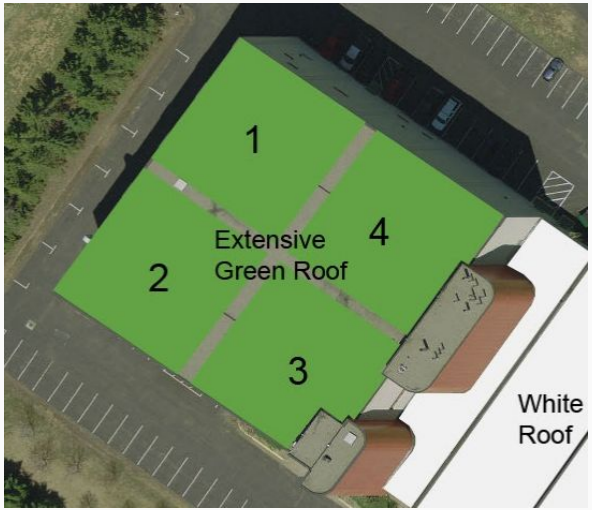
Green Roof

Educational Capabilities:

- Method for testing:
  - Plant hardiness
  - Water retention/uptake
  - Insulating ability
- Public outreach

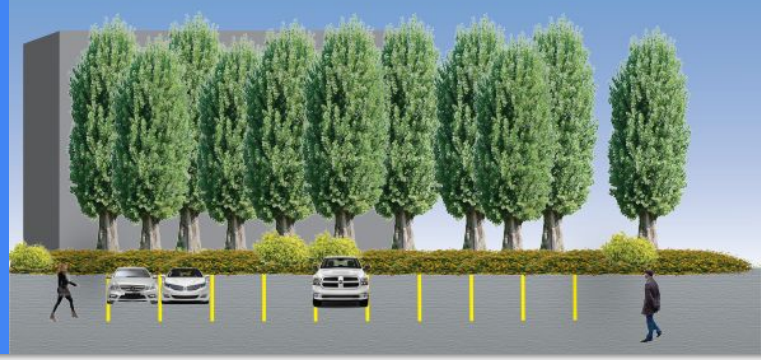
Additional Advantages:

- Water collection and cooling
- Aesthetic value



Energy Efficiency

Wind Break

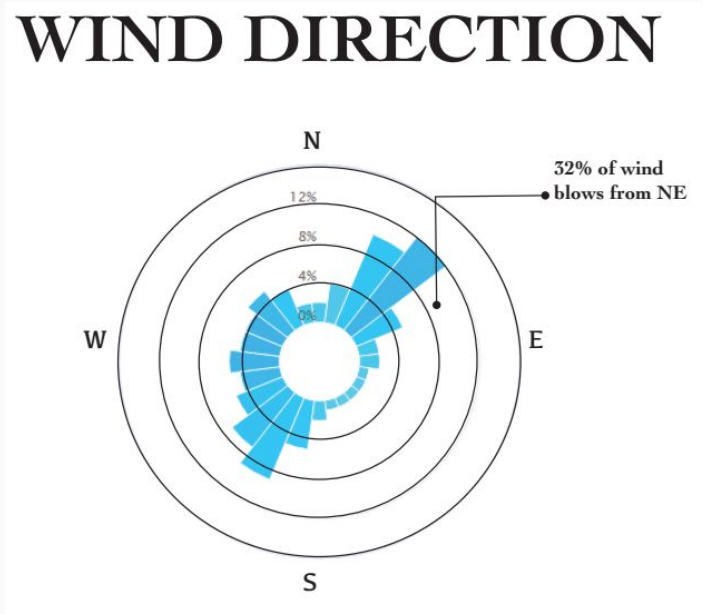


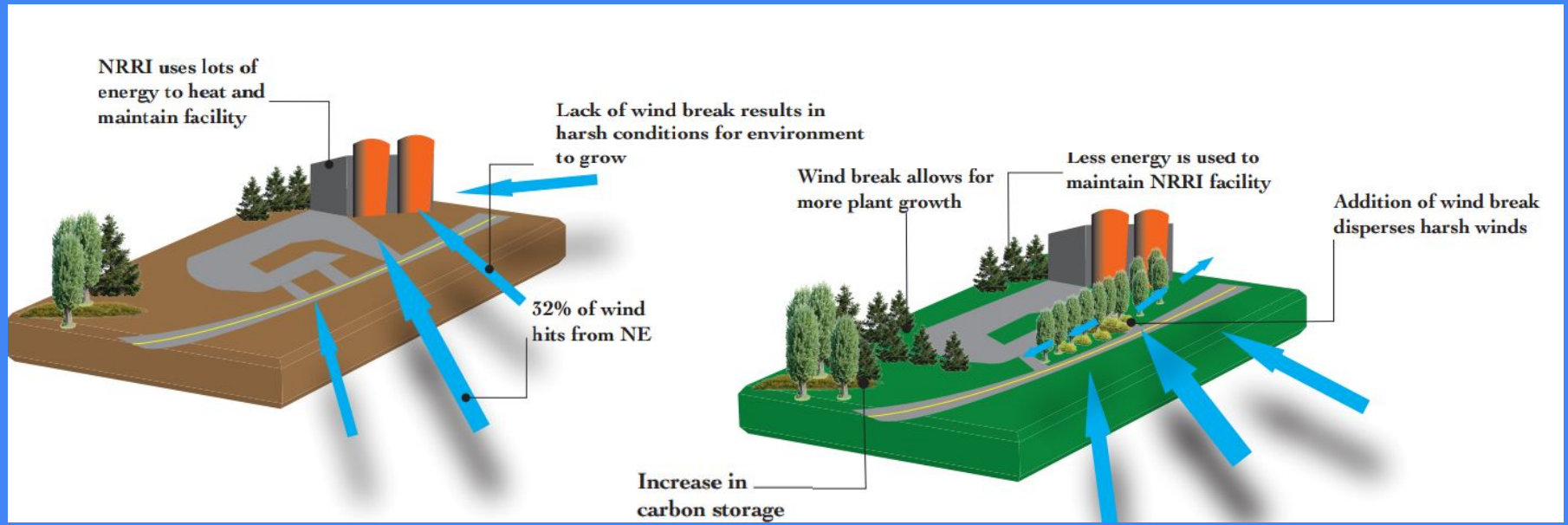
Reasons:

- Reduce advective heat loss
- Minimal maintenance

Additional Benefits:

- Carbon sequestration
- Added property value
- Habitat creation
- Living laboratory
- Water uptake




NRRI uses lots of energy to heat and maintain facility
Lack of wind break results in harsh conditions for environment to grow
32% of wind hits from NE
Wind break allows for more plant growth
Less energy is used to maintain NRRI facility
Addition of wind break disperses harsh winds
Increase in carbon storage

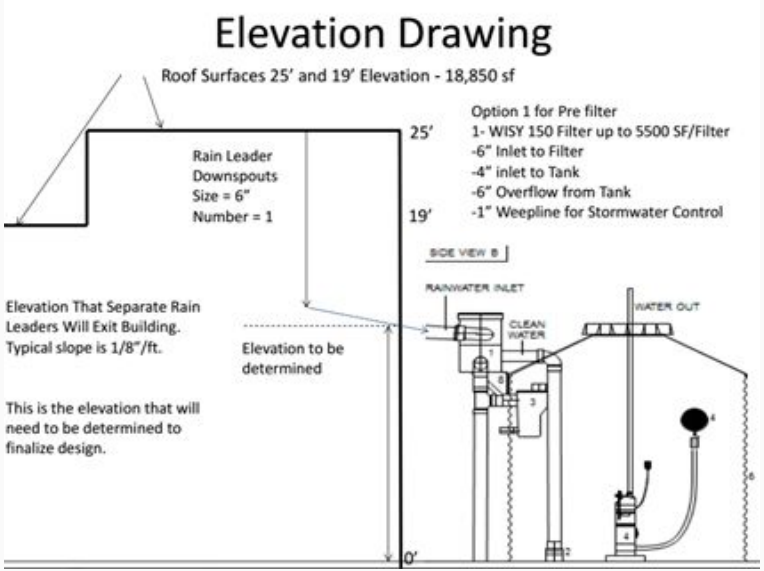
Rainwater Harvesting

Reasons:

- Reduce municipal water useage
- Rainwater recycling

Additional Benefits:

- Reduced water costs
- Reduced runoff



Rainwater Harvesting System

S.W.A.M.P.E.D. AT NRRI

Stormwater Analysis Management Program and Educator Development

EXISTING PROBLEMS

Impervious

59% of site is impermeable

Pervious

41% of site is permeable

Total Area

6.97 acres the site occupies

EDUCATE about research projects & concepts

ENERGY conservation & reduction

MANAGEMENT of stormwater and runoff

PROVIDE for a better future

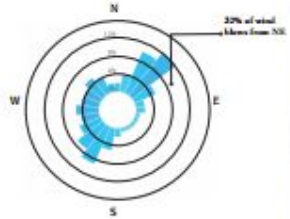
PROJECT GOALS

- Stormwater management to protect Miller Creek, an impaired trout stream
- Reduce runoff by green roof, bioswale, rainwater haverstting, created wetland, pervious surfaces
- Increased habitat for pollinators
- Carbon sequestration through tree planting
- Wind break
- Energy reduction

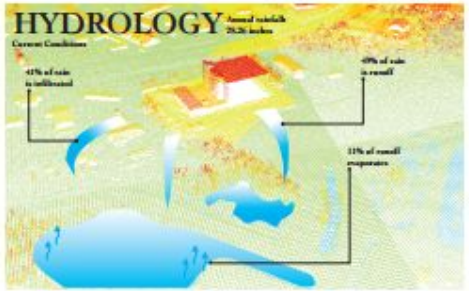
KEY GREEN INFRASTRUCTURE

- Green roof to collect rainwater & sustain plant life & prevent pollution to Miller Creek
- White roof to reflect heat and produce cooler runoff
- Rainwater harvesting to reduce NRRI water facility usage
- J-spouts for educational purposes and aesthetics
- Bioswale for stormwater runoff and add additional nutrients
- Constructed Wetland to filter rainwater in a natural environment
- Native Planting to replace impervious surfaces
- Wind Break to provide wind blockage & growth within prevailing conditions

WIND DIRECTION



HYDROLOGY



S.W.A.M.P.E.D.

Stormwater Analysis Management Program and Educator Development

PERFORMANCE

- 2,102 sq meters of green roof to collect rainwater & sustain plant life & prevent pollution to Miller Creek
- 708 sq meters of constructed wetland to filter rainwater in a natural environment
- 1,702 sq meters of rain harvesting to reduce NRRI water facility usage
- 666 sq meters of infiltration basin for water filteration
- Bioswale improve water quality and support plant growth
- 33 sq meters of taconite pavement for research
- 15% less annual runoff
- 16% more infiltration

OUTCOMES

Impervious

45% of site is impermeable

Pervious

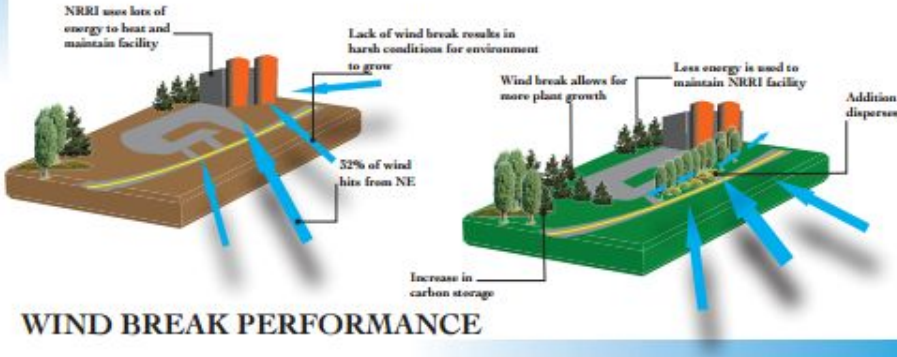
55% of site is permeable

Coverage

9.3 sq miles of the miller creek watershed will potentially be affected after changes

LASTING EFFECTS

- Cleaner cooler water
- Carbon storage
- Energy conservation
- Reestablish the impaired Miller Creek trout stream and surrounding water shed
- Education
- Habitat restoration



WIND BREAK PERFORMANCE