Mississippi Headwaters: The Business Case for Conservation
About the authors and their methodology

This report is a collaboration among McKinsey, The Nature Conservancy, and Ecolab to analyze the benefits and costs of improving water quality in the Mississippi Headwaters through land preservation and restoration.

Sources of insight and data and include:

- **More than 50 studies and data sources** from environmental research, state and federal reports
- **More than 15 interviews with experts** from Minnesota Pollution Control Agency, Explore Minnesota, other conservation efforts across the United States, universities, Ecolab, McKinsey, and TNC
- **Six case studies** of land conservation and water quality preservation across the US
- **Primary geospatial analysis**
We have a problem – pollution in the Mississippi River Headwaters is rising

Average nitrogen loads in the Mississippi River Headwaters
Kilograms of nitrogen, millions

Nitrogen is just one pollutant entering the Mississippi River

Others, like phosphorus and chloride, show similar increases

SOURCE: MNPCA, The Nature Conservancy Nitrogen model
Conversion of natural lands to housing, food production and industrial development is a major cause of pollution in the Mississippi River Headwaters.

Land conversion causes decreased water quality because it ...

Increases pollutant use on land such as:
- Nitrogen and phosphorus in fertilizers for crops and lawns, sewage, and manure
- Chlorine in road salt
- Bacteria and viruses in sewage and manure

Decreases natural lands available to filter pollutants
- From 2007 to 2012 Minnesota had the:
  - Highest wetland loss
  - Second highest rate of deforestation

Land conversion in Minnesota is continuing as our population and economy continue to grow

About 100,000 acres were converted for development from 2007 to 2012

Percent growth since 1982

About 250,000 acres were converted to cropland

Relative cropland expansion, 2008-2012

Recent conversion was particularly within the Mississippi Headwaters

1 Map shows new cropland in 2012 since 2008. In red hotspots, cropland more than doubled.

The negative impact of land conversion on water quality has already been observed in Southern Minnesota throughout the Minnesota River Basin.

In the Minnesota River Basin little natural land remains. And water quality has degraded. Majority of water bodies cannot support aquatic life or are unsafe for swimming.

- 90% of wetlands drained
- 80% of land converted
- 80% of rivers and streams
- 57% of lakes

**Sources:** Minnesota Environment and Energy Report card (2017); MNPCA “Our Mississippi River” (2017)
And the Mississippi Headwaters is quickly heading in the same direction

Water quality in Minnesota’s lakes

We face a clear choice in the Mississippi Headwaters: Protect our clean water now, or try to clean it up after we’ve polluted it
It costs almost four times more to restore the land around a polluted river than to protect the river before it is polluted.

Once a river is polluted, it is very expensive to clean up. Estimates to clean up the Minnesota River are around $2 billion. Costs for the Mississippi River Headwaters, a larger watershed, would be higher.

<table>
<thead>
<tr>
<th>Preservation</th>
<th>Restoration</th>
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<tbody>
<tr>
<td>1,250</td>
<td>4,275</td>
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Average cost per acre in Minnesota, $
The Nature Conservancy has proposed a highly targeted plan to protect and restore the most critical 200,000 acres

Multiple benefits analysis prioritized the most critical 200,000 acres, less than 2% of the 13 million acre Mississippi Headwaters

Note: Map shows subset of plan. Analysis was conducted for 100% of Headwaters

SOURCE: The Nature Conservancy
Cost of proposed plan to protect Mississippi River is $0.4 – 0.6 billion

Estimates to protect the Mississippi River Headwaters are around $0.4 – 0.6 billion over 10 years

Plan includes…

- Restoring 100,000 acres of land

- Protecting 100,000 acres of wetlands, grasslands, and forests

$0.4 – 0.6 billion

Investments would include protecting up to 100,000 acres through conservation easements from willing landowners, with minimal impact on local tax revenues

SOURCES: MN Environment & Energy Report card (2017); MNPCA
The Nature Conservancy has seen success from similar programs

<table>
<thead>
<tr>
<th>The Nature Conservancy</th>
<th># of acres protected or restored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mississippi Headwaters (proposed)</td>
<td>200</td>
</tr>
<tr>
<td>Forest Legacy Program Minnesota Northwoods</td>
<td>330</td>
</tr>
<tr>
<td>Chesapeake Bay watershed</td>
<td>6,500</td>
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**Benefits observed**
- Land continue to provide forest products, jobs, access to outdoor recreation, and tourism revenues
- Generates an estimated $24 billion from retained tourism, avoided water treatment costs, cleaner air, etc.
The plan would help protect about $130 million in direct benefits

Benefits of restoring or preserving about 200,000 acres in the Mississippi Headwaters
$ millions, 2020-2050¹

<table>
<thead>
<tr>
<th>Benefit Description</th>
<th>Value (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoided water treatment costs</td>
<td>61</td>
</tr>
<tr>
<td>Retained property value and taxes</td>
<td>32</td>
</tr>
<tr>
<td>Avoided flood damages</td>
<td>28</td>
</tr>
<tr>
<td>Retained tourism revenues and jobs</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>129</strong></td>
</tr>
</tbody>
</table>

¹ Present value figures from 2019 to 2050, assuming benefits begin accruing the year restored or protected acres are purchased, discounted at 2.875% as recommended by the Bureau of Reclamation for federal water infrastructure projects.

SOURCES: Detailed in appendix, MNPCA
Additional indirect benefits, such as clean air, would be worth $360 million.

$243 million in carbon mitigation

$116 million in public health benefits from cleaner air

Total Direct and Indirect Benefits = $490-500 Million

SOURCES: “Determining socially optimal rates of nitrogen fertilizer application” (Gourevitch, Keeler, & Ricketts, 2018); Social cost of carbon (Minnesota Public Utilities Commission)
Protecting the Mississippi River Headwaters now avoids billions in future costs and allows us to enjoy clean drinking water and clean rivers.

Estimated costs of protection and restoration

$ billions

- Act now: Protect the Mississippi
- Delay: Clean the Mississippi later

2 – 8

0.5

2.0

2.5

2.5

Delaying action will carry costs beyond the $3-8 billion in clean up, some of which cannot be restored, including:

- Years of living with polluted rivers and lakes
- Higher water treatment costs
- Lost property value
- Lost tourism revenues and jobs
- Increased flood damages
- Lost biodiversity
Clean water is crucial for the health of Minnesota’s economy and people. Natural lands such as forests, grasslands, and wetlands act as nature’s filtration system and are important for keeping our water clean.

However, our water quality is at risk. Pollution in our water is increasing as the natural lands in the Mississippi Headwaters convert to development, farmland, and industry increasing the pollutants entering the system and reducing the presence of natural filters.

We have already seen the negative impact of land conversion on water quality in the Minnesota River Basin and expect similar outcomes in the Mississippi Headwaters if it is not protected.

We face a choice: to protect our waters now and prevent further pollution or delay action and hope to clean them later.

If action is delayed, it will cost billions to clean the Mississippi River Headwaters.

Acting now to protect our water by preserving about 100,000 acres and restoring another 100,000 in the Mississippi Headwaters – a tiny fraction of the 13 million acres of the Headwaters – would cost $400-600 million.

Acting now retains $130 million in direct benefits such as avoided water treatment costs, retained property values and tourism revenue and jobs, plus $360 million in indirect benefits.

Protecting the Mississippi River Headwaters now avoids billions in future costs and allows us to enjoy clean drinking water and clean rivers.
### The plan to act now avoids about $61 million in water treatment costs

**Avoided water treatment costs from land conservation in Mississippi Headwaters**

<table>
<thead>
<tr>
<th></th>
<th>Twin Cities &amp; St. Cloud</th>
<th>900 community wells</th>
<th>140,000+ private wells</th>
<th>Waste water treatment</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drinking water</strong></td>
<td>41</td>
<td>3</td>
<td>1</td>
<td>16</td>
<td>61</td>
</tr>
</tbody>
</table>

- **Reduces ongoing water treatment costs**, by reducing the need for filters and chemicals to treat sediment: A 10% reduction in sediment results in an average 2.6% reduction in ongoing costs.

- **Avoids investment in expensive new water treatment facilities**, average cost is $3.5 million.

- **Several communities have already installed new facilities and need is expected to rise**, e.g., Park Rapids spent $11 million on nitrate treatment interventions at a cost of nearly $3,000 per person.

- **Increases in nitrate levels could require remediation**:
  - Average cost of $700 per well
  - Actions include: buying bottled water, installing reverse-osmosis treatment systems, or digging a deeper well.

- **Avoids costly investments in new waste water treatment plants to control phosphorus**, like Mankato that installed a new, $25 million plant.

- **Mississippi River Headwaters yield about 1.5 pounds of phosphorus per acre per year and average cost to treat is about $11 per pound**.

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1 Present value figures from 2019 to 2050, assuming benefits begin accruing the year restored or protected acres are purchased, discounted at 2.875% as recommended by the Bureau of Reclamation for federal water infrastructure projects.

**SOURCE:** "Beyond the Source" (TNC, 2017), "Drinking Water by the Numbers" (Minnesota Department of Public Health, 2017) Drinking Water Annual Report (MN Department of Public Health, 2014), Detailed Assessment of Phosphorus Sources to Minnesota Watersheds (Barr Engineering Co., 2004)
Additionally, lakefront homeowners across the Headwaters will retain over $30 million in property value.

When nutrients, like nitrogen and phosphorus, enter the lakes algae grows.

Algae growth reduces water clarity, chokes out native plants, threatens fish, and can be toxic leading to illness.

Swimming is no longer an option.

The property values of the nearly 100,000 lakefront homes in the Mississippi Headwaters depend on clean, clear lakes for swimming, fishing, and boating.

SOURCE: MPR
Maintaining water quality and keeping our lakes clean and clear maintains property values at lakefront and near lakefront homes

- Land conservation reduces the phosphorus and nitrogen that enter our lake which in turn limits algae growth and helps maintain lake clarity
  - TNC’s plan reduces the nitrogen load in the Mississippi by about 5% and similar reductions are expected in lakes

- From 2020 to 2050 maintaining water clarity is worth about $32 million
  - Each Minnesotan lakefront homes loses about 0.5% of it’s property value per foot of clarity lost
  - The average lakefront property is now worth around $250,000
  - There are 80,000 to 100,000 lakefront homes in the Mississippi River Headwaters
Preventing pollution of the Mississippi Headwaters also protects the economy of north central Minnesota, which is based on tourism.

Tourism brings over $2.3 billion annually to the counties in the Mississippi Headwaters.

In the short term, keeping waters clean will save 200 jobs in resort industry.

SOURCE: Explore Minnesota
Acting now retains about $8 million in tourism revenues and jobs

Maintaining water quality and keeping our lakes clean and clear also keeps out of state tourists visiting the Mississippi Headwaters

Tourism revenues

- Each foot of clarity translates to 70 out of state visits lost per lake
- The average visitor spends $130 visits per trip

Jobs

- Tourism spend supports 160,000 tourism related jobs in the Mississippi River headwaters, especially in Anoka, Stearns, Wright, and Crow Wing
- Conservation plan would save around 200 jobs

SOURCE: TNC nitrogen model; Krysel (2005); TNC GIS data; UMN aerial lake clarity; MNPCA lake clarity data; Keeler Recreational Demand for Clean Water; Explore MN 2016 Tourism statistics; Explore MN traveler profiles; Loomis (2018); Bureau of Labor Statistics; MN Department of Employment and Economic Development Labor Market data; Recreation.gov
Acting now yields about $29 million in flood control benefits

- **$29 million in flood control benefits through 2050**
  - Wetlands in Minnesota provide about $54 per acre in flood control benefits by retaining storm waters and releasing them slowly
  - TNC’s plan conserves 24,300 acres of wetland: 20,800 acres planned for and 3,500 protected from conversion
- Overall, Minnesota faces about $100 million in flood damage annually – a figure that is likely to rise if the climate continues to become warmer and wetter

1 Present value figures from 2019 to 2050, assuming benefits begin accruing the year restored or protected acres are purchased, discounted at 2.875% as recommended by the Bureau of Reclamation for federal water infrastructure projects.

SOURCES: MPR; The Wetlands Initiative Flood Damage Reduction in the Upper Mississippi River Basin