Working with Small Communities

Helping to create Solutions

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SERVICE

- Professionals – Designers, Inspectors, Pumpers, Installers
- Research and Demonstration
- **Homeowner Operation & Maintenance**
- **Small Community Wastewater Solutions**

There are 600,000 on-site sewage treatment (septic) systems - (27% of households)

Over 30% of new homes have septic systems

- Typically composed of a septic tank and Soil treatment area

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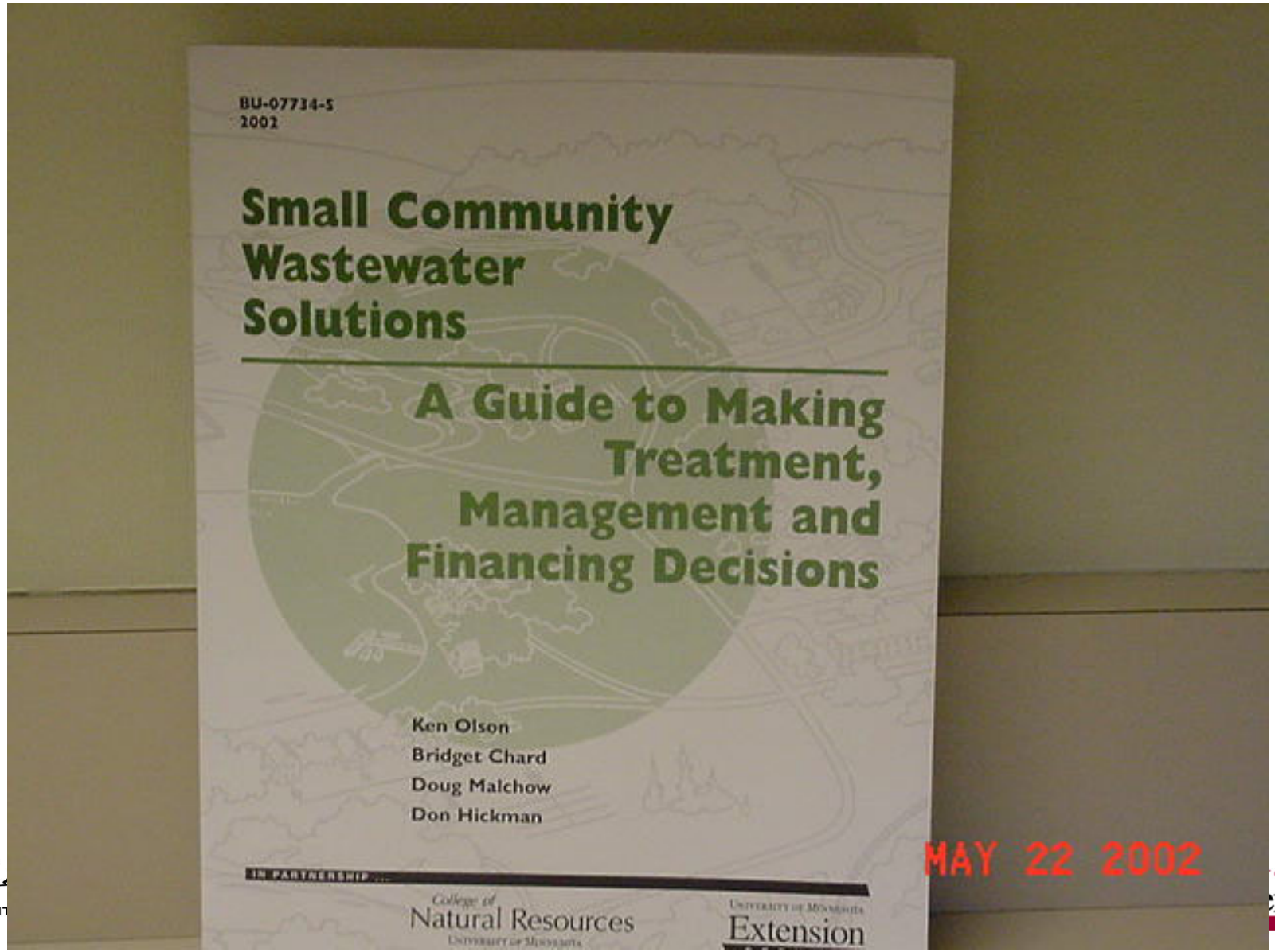
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Small Community Wastewater Solutions
A Guide to Making Treatment, Management and Financing Decisions
Ken Olson
Bridget Chard
Doug Malchow
Don Hickman
IN PARTNERSHIP ...
College of Natural Resources
University of Minnesota Extension
MAY 22 2002

What Is Sewage/Wastewater?

Water and Product Use

Bathroom (60%; 40% toilet; 20% water use)

Kitchen (20%)

Laundry 20%)

No treatment: Utility Rooms, outdoors

Lint, Effluent Filters.

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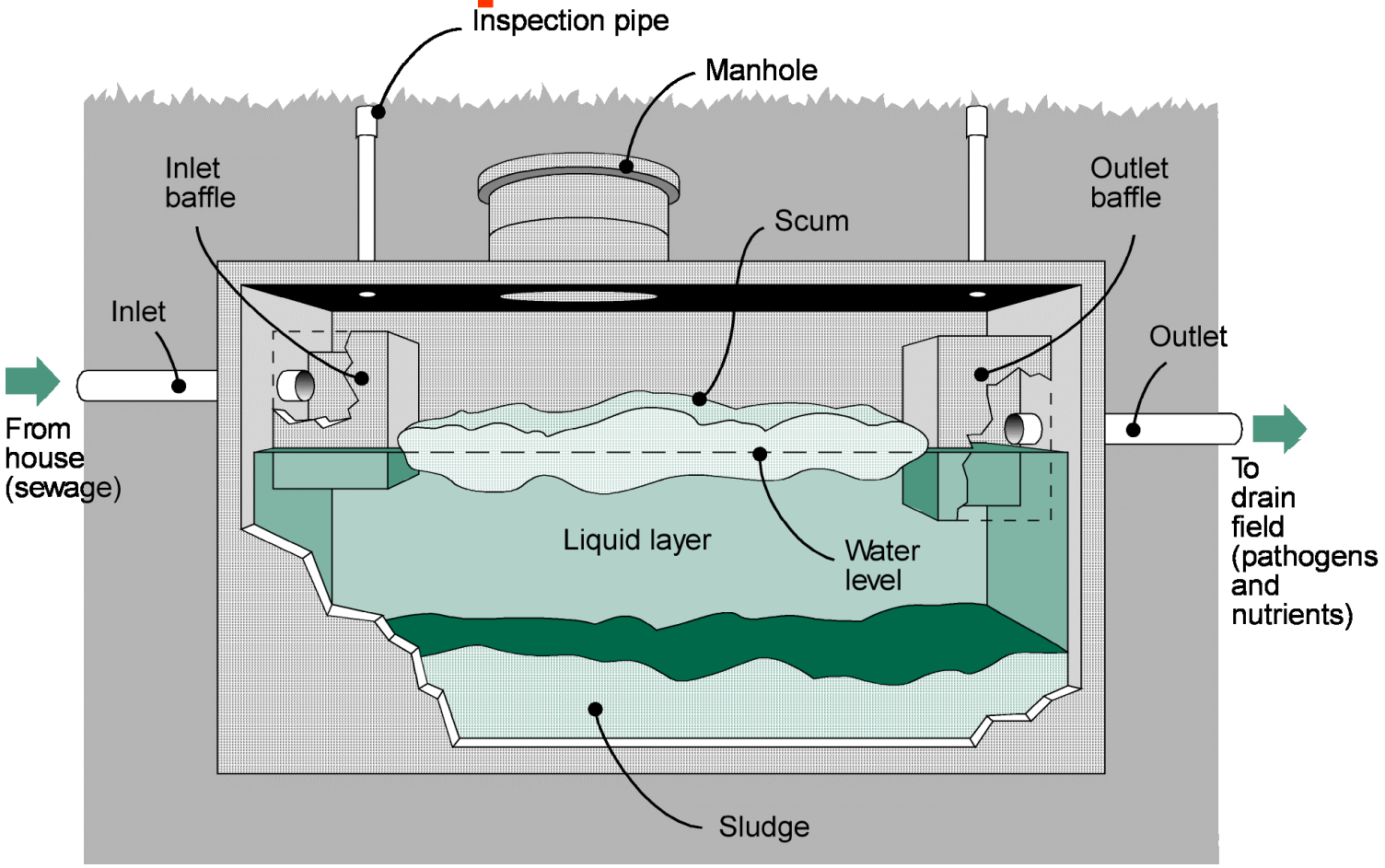
Septic Tank



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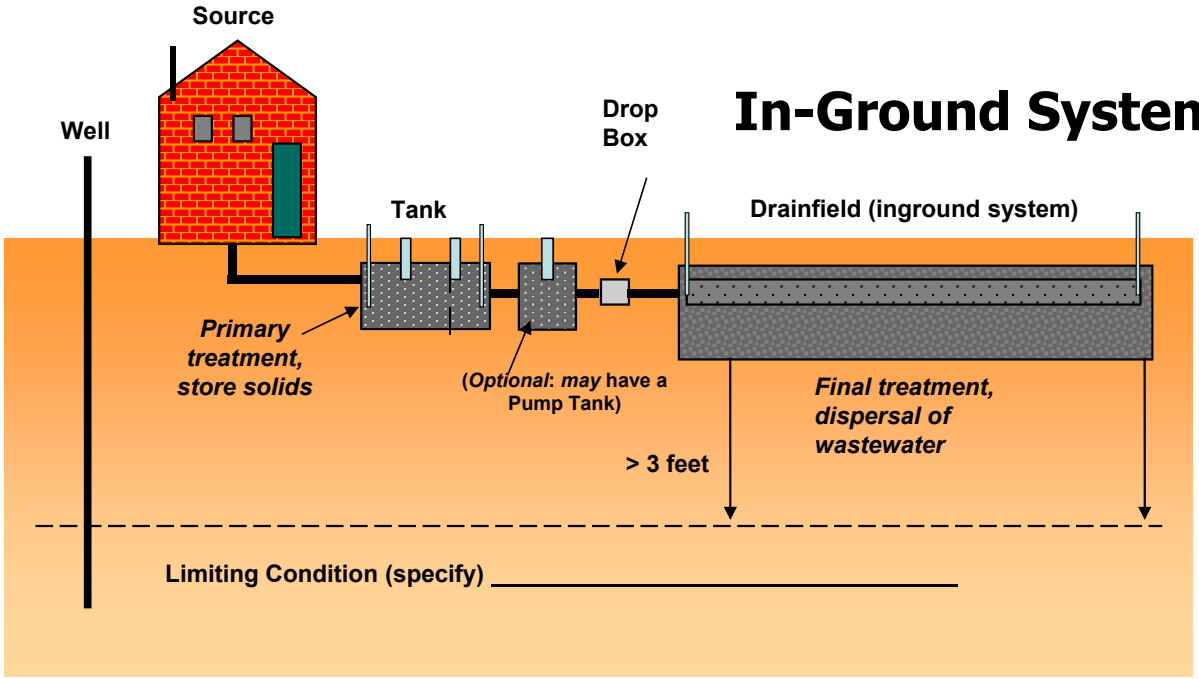
System Components



Well, tank, drainfield may serve one or more homes

"Standard": 1 each/home

"Cluster": serve 2 or more homes

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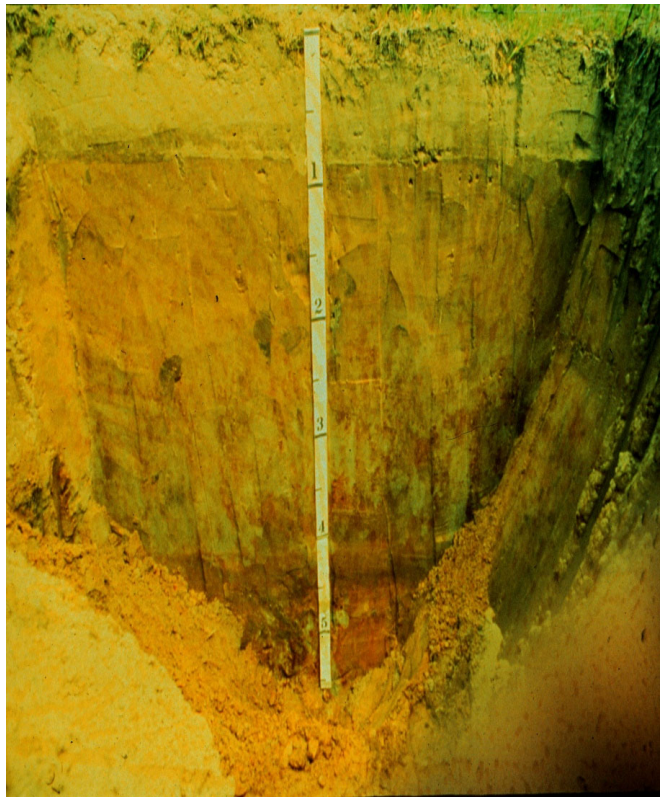
Mound System

System Depends on the Soils "mottling"



Managing Small Community Wastewater Involves

- Local Understanding
- Working with Professionals
- Process for community to select options
- Treatment Options
- Costs & Financing
- Community Process
  - Management of Systems
  - Community Structures

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General community wastewater management

- Protect human/family health
- Protect ground & surface water - environment
- Affordable costs
- Consistent with community character & values
  –Informed residents:
  - Part of process
  - Educated on use of systems
  - *Community* drives the process

- All wastewater goes to a good treatment facility! Appropriate options for community

- All treatment facilities are well managed!

Today's community wastewater treatment plans must consider

- Desired community character ('urban'/'rural')
- All centralized & de-centralized technologies
- "Optimum" system design
- Improved management of all systems
  - management plans for all systems
  - operating permits for advanced technologies
- Current & future regulations: TMDL, "Impaired Waters"

The Community Process

- Create **ownership** of issue and benefits of solving it on own terms.
- Maintains **values, character of the community**, increase property values/ salability, investing in community, etc.:
  the long-range plan of our community
- Create understanding of **"the Shift"** from paying very little for disposal to paying $$ for treatment and management.

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Community solution criteria

- **Effective** treatment – protect health & environment
- **Affordable** life-cycle costs: installation, operation, maintenance, repairs, monitoring, replacement
- **Sustainable** – water supply & economics
- **Esthetically** acceptable
- **Reliable**
- **Manageable**
- **Adequate** space
- **Flexible** – flow & waste strength
- **Consistent with community values & culture**
- **Consistent with land use plan**
- **Fits a *long range plan***

5 Phases of Community Process: *How a Community Makes Good Group Decisions*

1. **Understanding the situation**: *defining the problem, collecting and interpreting information and data*
2. **Exploring the Options**: *Treatment, Management, Organizational Structures, Funding*
3. **Making Informed Decisions**: *Sorting out the options*
4. **Implementing the Decisions**: *Final plans, construction*
5. **Managing the System**: *Monitoring, Operation, Maintenance, Administration*

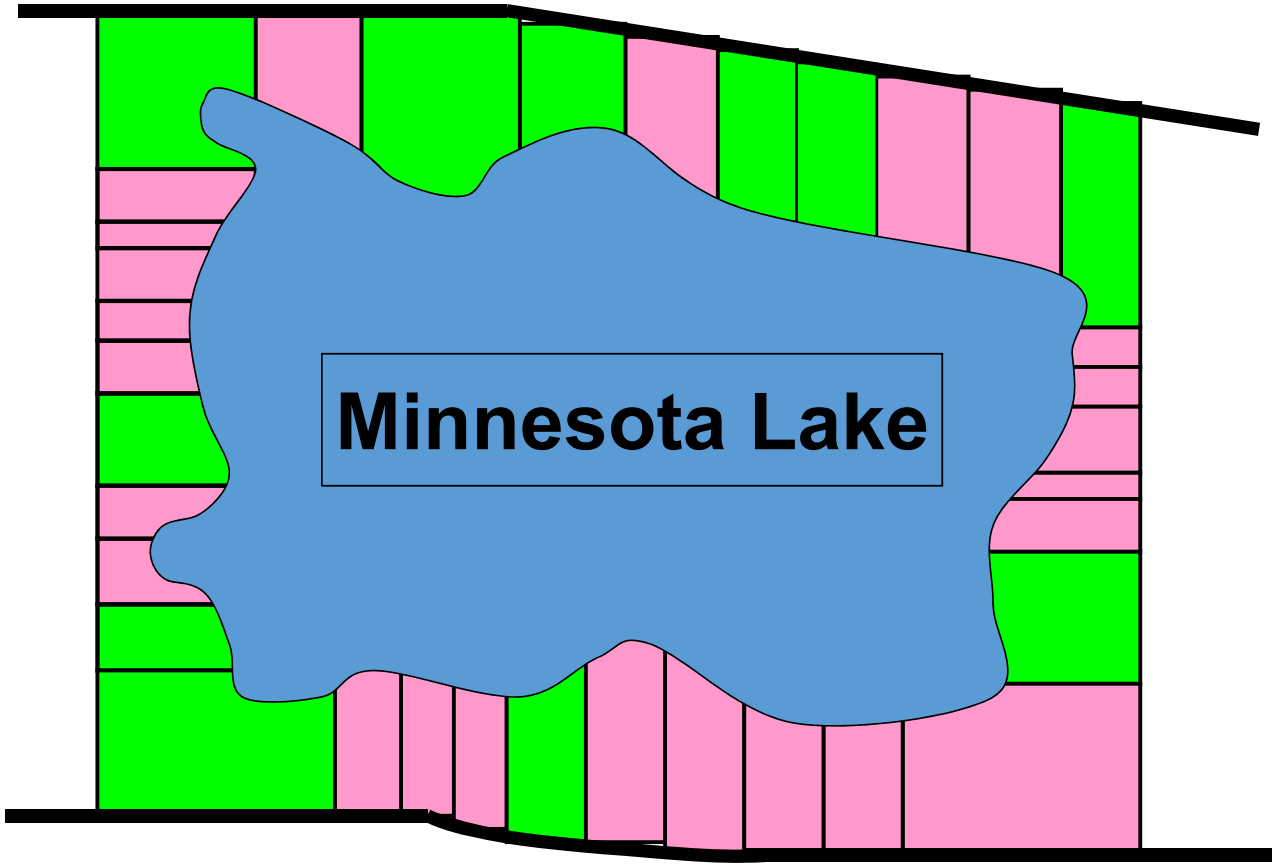
Understanding the Situation

Allow 6 – 12 months

- Initial group identifies a wastewater issue, forms a task force
- Lay out the strategy
- Conduct a basic Homeowner Operation and Maintenance Program (HOME or Wastewater 101)
- Conduct an Introduction to Small Community session
- Task force gathers community reactions
- Establish greater diversity on the task force

Understanding the Situation

- Conduct the community assessment: onsite assessment, land use plans, shoreland ordinances, community data, zoning information, much more
- The visioning process: community establishes their goals, identify current situation, long range goals, agreement on community values and mission
- **Complete assessment includes what is, what the residents want, what is affordable and practical**
- *COMMUNICATE!!*



Comply | Don't Comply

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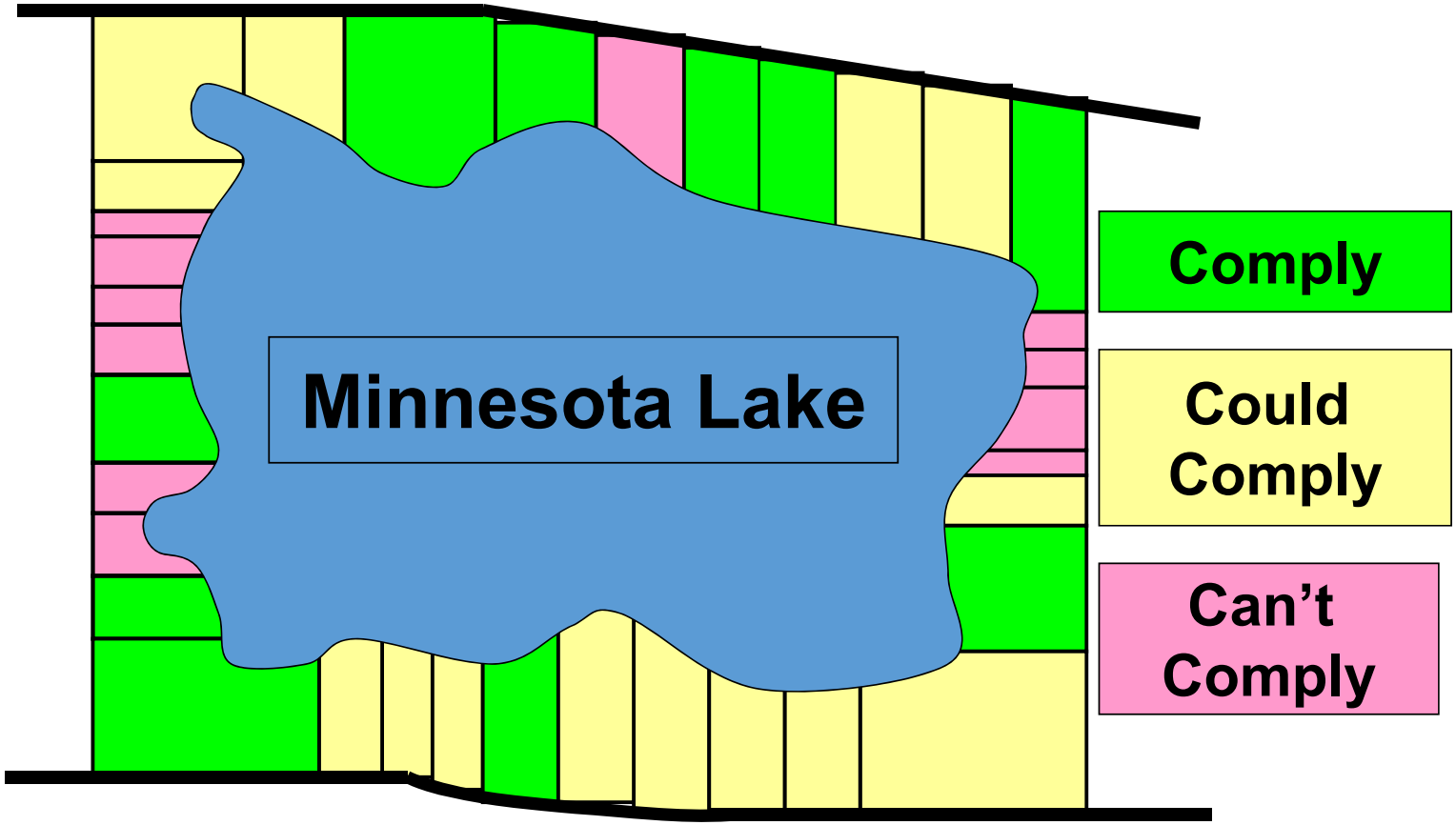

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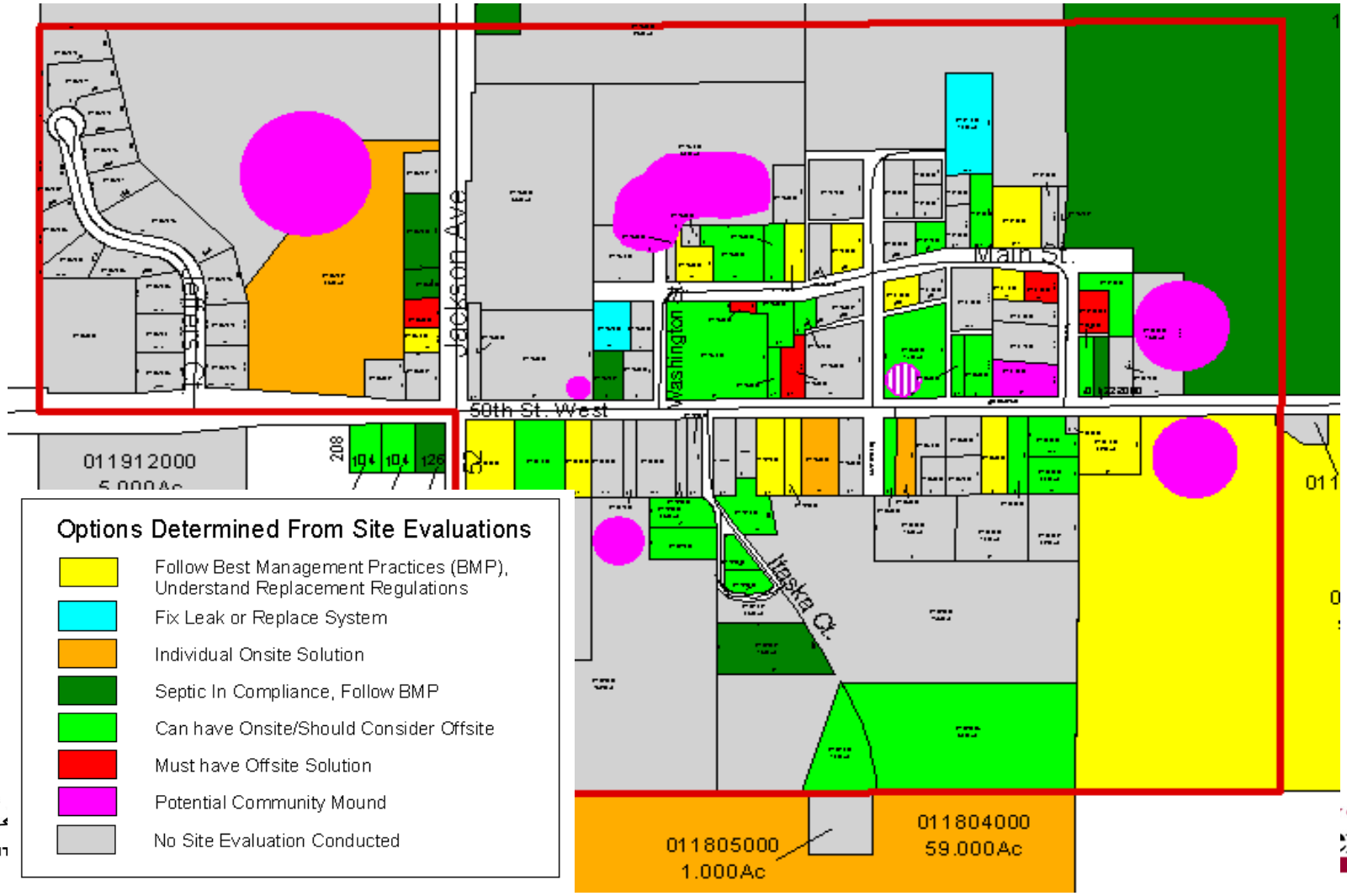
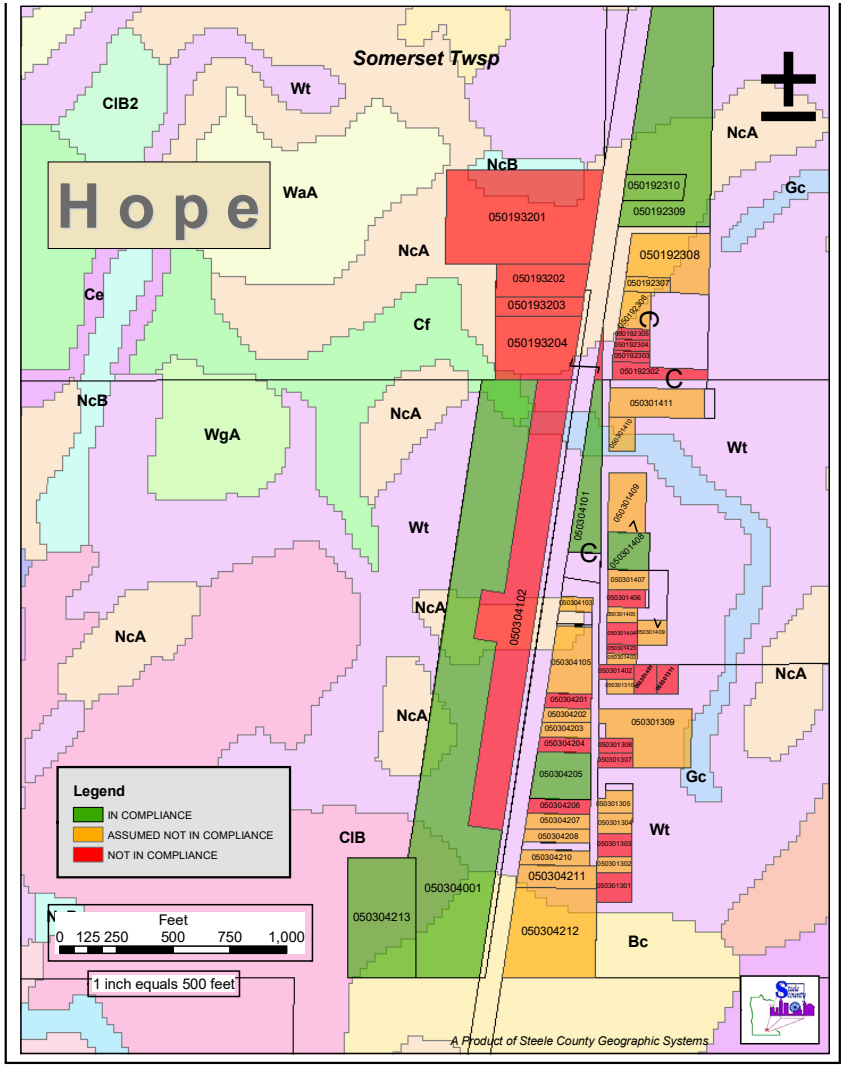
Site Evaluation Conclusions: Veseli



Hope is in SE Minnesota, in Steele Co.

- **working on wastewater issues since 1969**
- **SE Project working with them:**
  - **Education**
  - **Assessment**
  - **Homeowner surveys**
  - **site evaluations**
  - **record searches**
  - **formed task force**
  - **Working on common mission, goals, exploring options**



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Explore the Options

Allow 18 – 36 months

- Re-evaluate make up of the task force. Task Force should be "fluid" – members come and go as needed; add ex-officio resource people as needed. Task force voting members should live there.

- Leadership of the task force becomes critical

Explore the Options,

page 2

- Collect information on the options for:
  - Wastewater treatment (centralized and decentralized, standard treatment, alternative treatments)
  - Management options and requirements
  - Organizational structure
- Now ready to contact engineers and request RFP's and RFQ's; begin groundwork.
- Task force reviews all options
- ***COMMUNICATE!!***

Making the Decisions

Allow 3 – 12 months

- **Wastewater Treatment Options:**
  - Task Force selects the options that consider viable
  - Send out RFP's and RFQ's to engineering firms specifying your option choices
  - Interview engineers, negotiate contracts
- **Organizational Structure:**
  - Work with local government to determine choices
  - Begin process to form a legal structure
- **Funding**:
  - May need a grant writer
  - Work with funding agencies
- ***COMMUNICATE!!***

- Leaky Tanks
- Inadequate vertical separation to water table (3 ft.)

Trench

Tile line

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Water and Wastewater Options

- Individual septic systems and individual wells
- Individual septic systems and group water
- Group septic systems and Individual wells
- Group septic systems and group water

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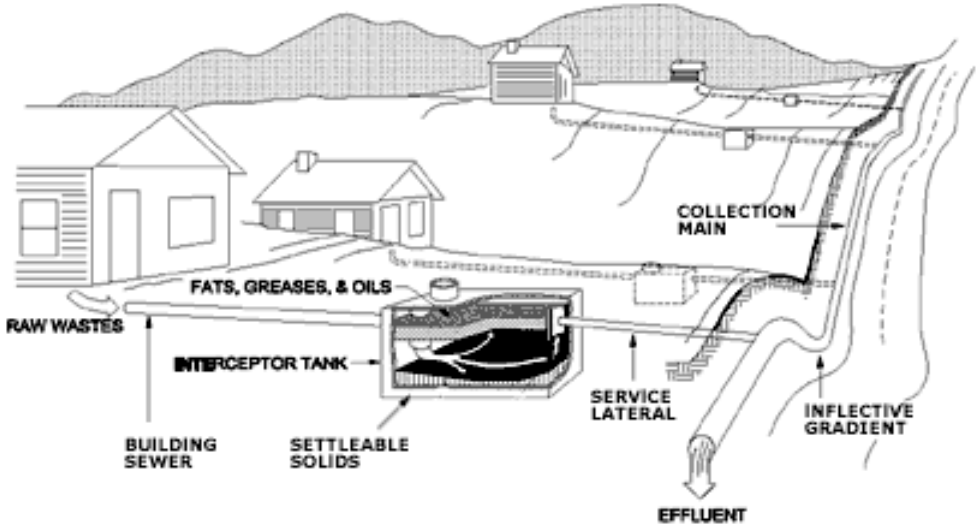
Options for the Community

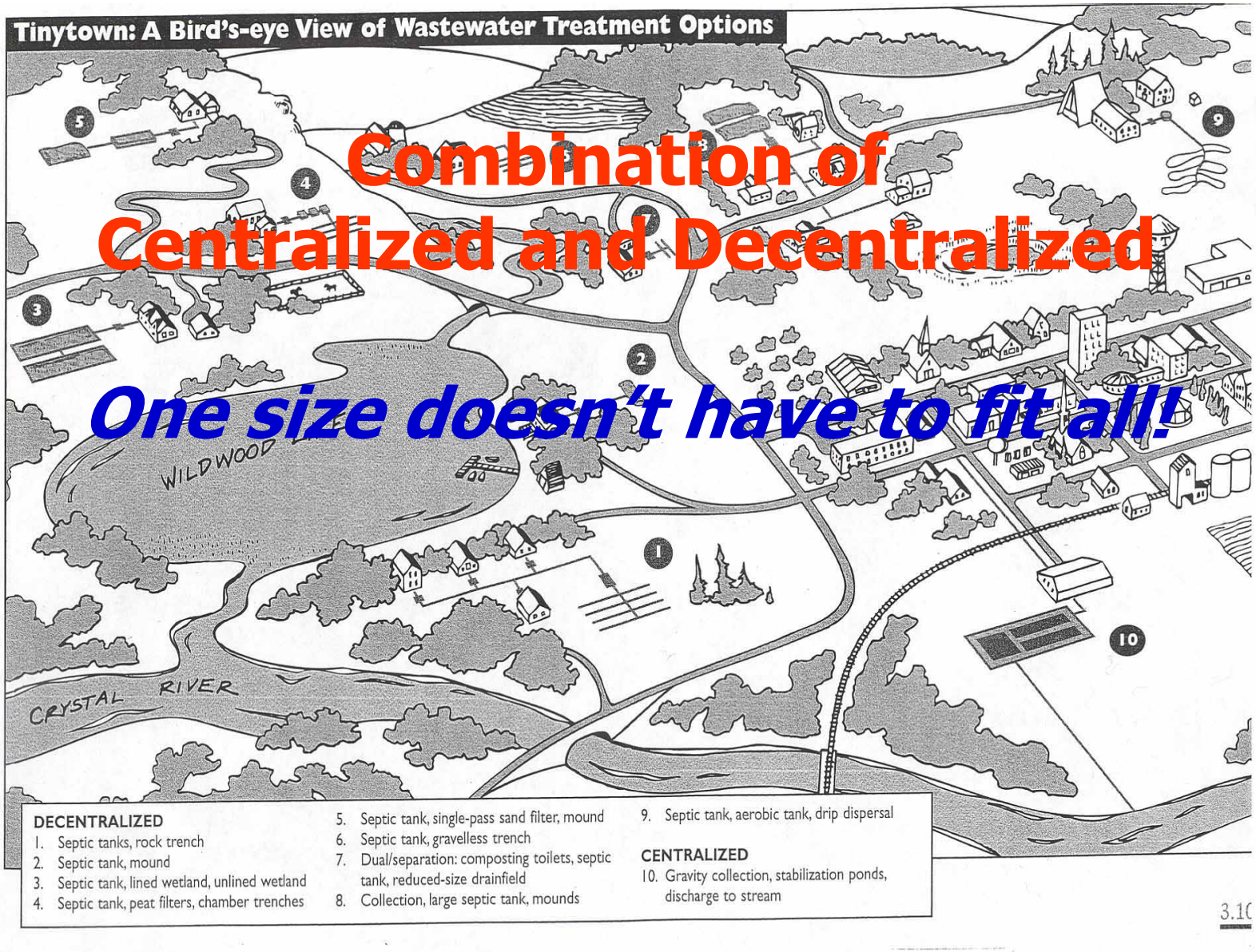
A good community wastewater treatment plan doesn't necessarily mean 1 wastewater treatment plant!

- **Decentralized:**
  - **Individual systems**
  - **Small "cluster" systems**
  - **Large "cluster" systems**
- **Centralized:**
  - **City-wide – municipal – system**
- ***Combinations***

Centralized Collection & Treatment (*surface water discharge*)



Often called package plants – municipal systems



Combination of Centralized and Decentralized

One size doesn't have to fit all!

Q: Do on-site systems ever fail to properly treat wastewater?

- A: **Yes**
- **Design/construction** - type chosen - cesspools & bad soil determinations, breaks, leaks in & out (*designer, installer problems)*
- **Over loading (*homeowner issues)***
- **"Bad" things down the drain (*homeowner issues)***
- **Improper maintenance** - pumping frequency & techniques, knowledge, cost **(*homeowner issues)***

Q: Do centralized systems ever fail to properly treat wastewater?

- A: **Yes**
- **Design/construction** - type chosen, breaks, infiltration/exfiltration - “leaks” in & out, “by-passes” ***(designer, installer problems)***
- **Over loading** ***(homeowner and/or management issues)***
  - **“Bad” things down the drain** ***(homeowner issues)***
- **Improper maintenance** - skills & money ***(management issues)***

"Alternatives"- Modifications or additions to trenches, mounds, beds, at-grades

Standard

- Trenches or at-grades – pumped from several homes
- Mounds (1 large or series)
- 1 tank/home or shared with neighbors

Pre-treatment

- Aerobic tanks
- Single pass sand filters
- Peat filters
- Constructed (lined) wetlands
- Textile/fabric filters
- Re-circulating filters

"Alternatives"- Modifications or additions to trenches, mounds, beds, at-grades

Collection Systems

- **Conventional gravity**
- **Pressure systems – may have 1 tank per home, or per 2/3**
- **May include grinder pumps**

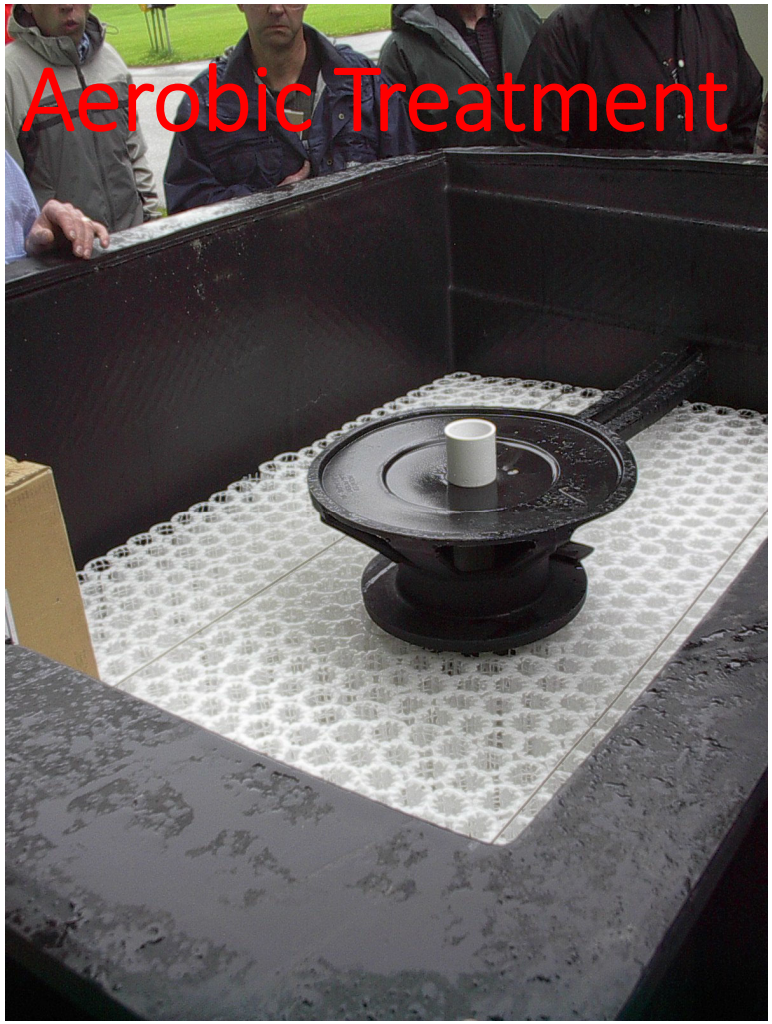
Final treatment/dispersal

- **Drip dispersal- grade or below**
- **Constructed (unlined) wetland**
- **Surface to lake, river, wetland**

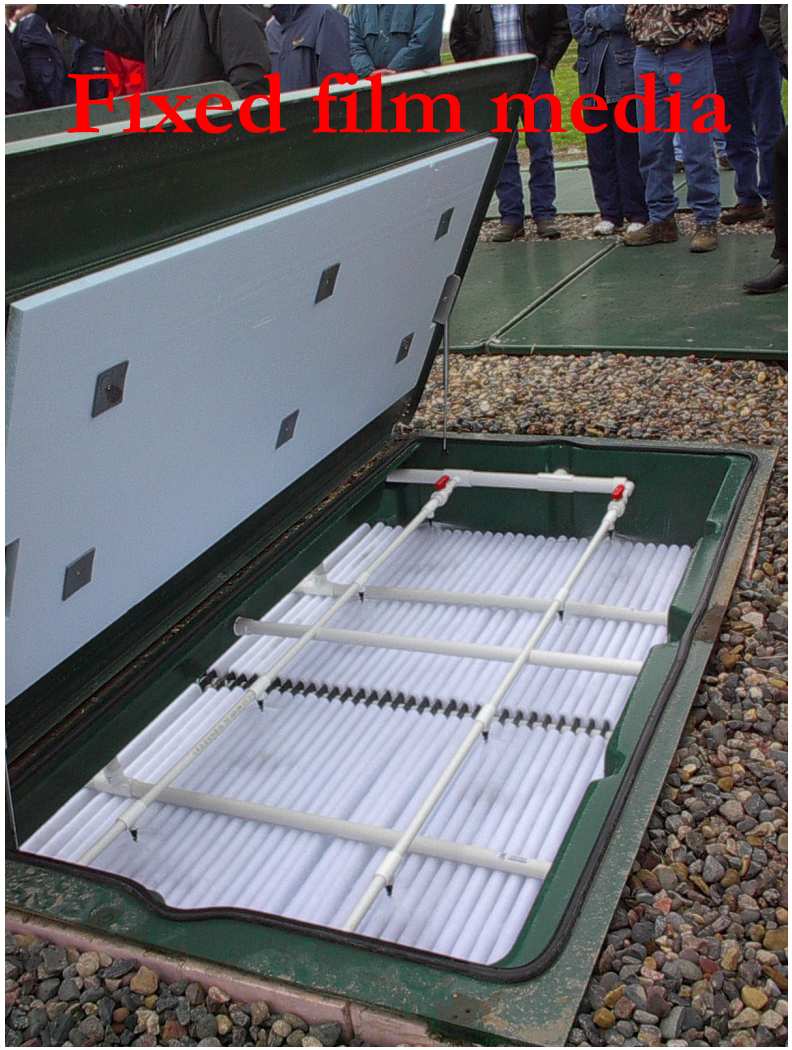
Are the non-standard systems better than the standard ones?

- Yes & No!!!
- Same goal ‘treatment’ - different route
- Trenches & mounds are still good choices
- Less data and design guidelines available for non-standard systems
- Management increases
- Total costs are likely to increase
- Pre-treatment may lengthen life and/or improve performance
- Pre-treatment steps may be replaceable

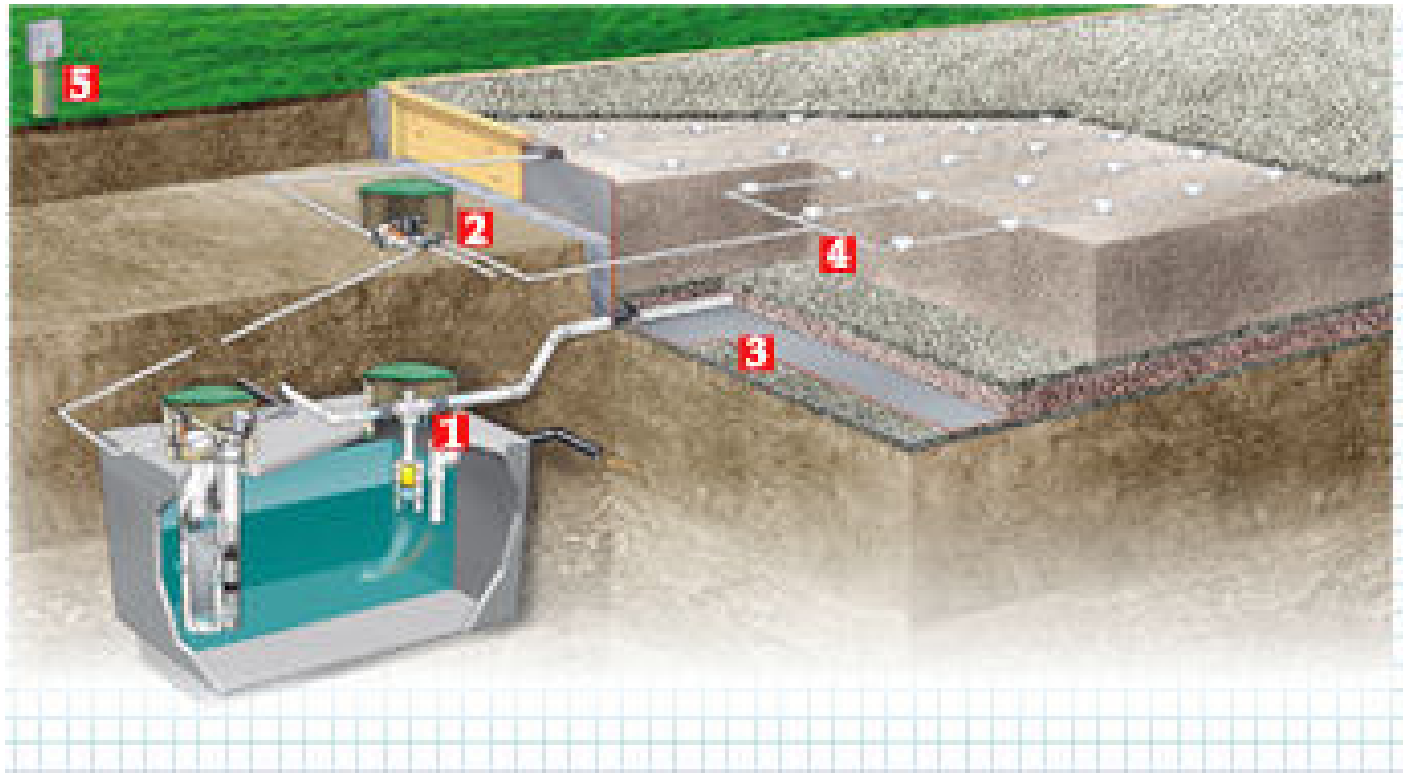
Aerobic Treatment



Fixed film media



Single Pass Sand Filter



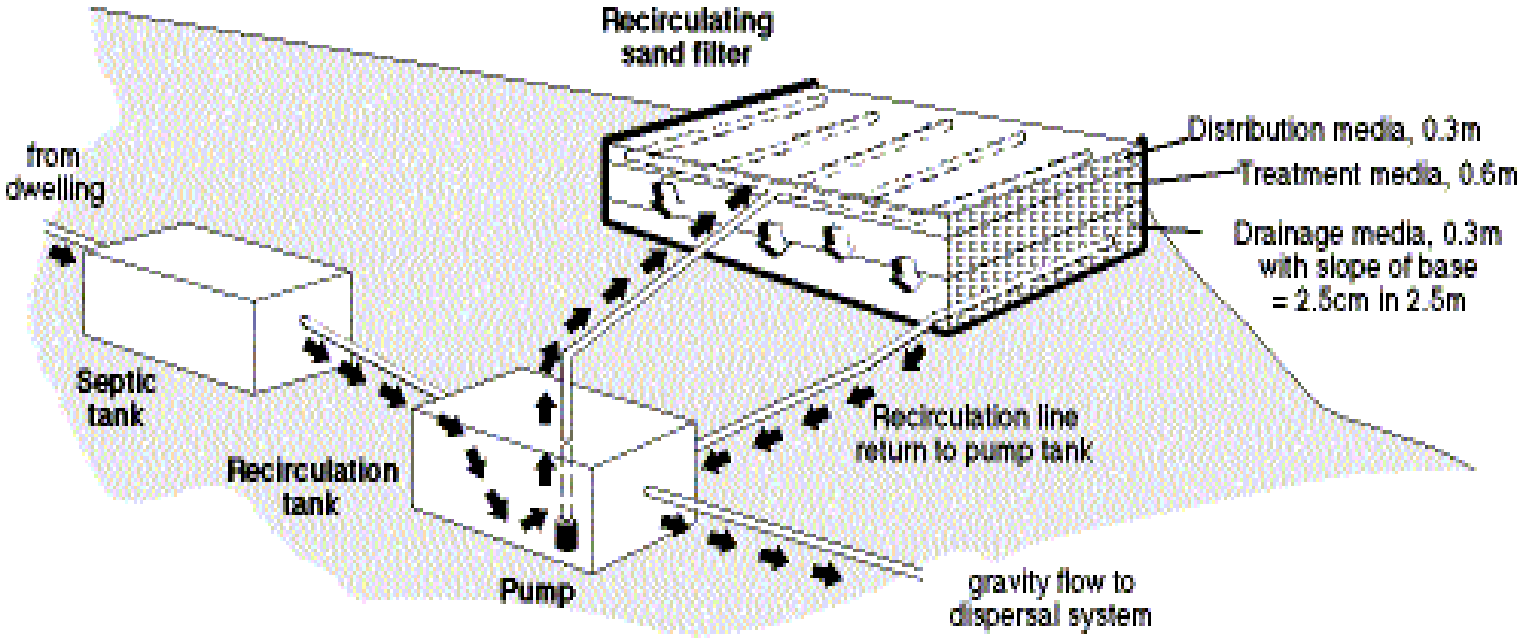
Re-Circulating Sand Filter

Peat Filter


Modular Peat filter; 180 bedroom development; 180 modules
OCT 1 2002

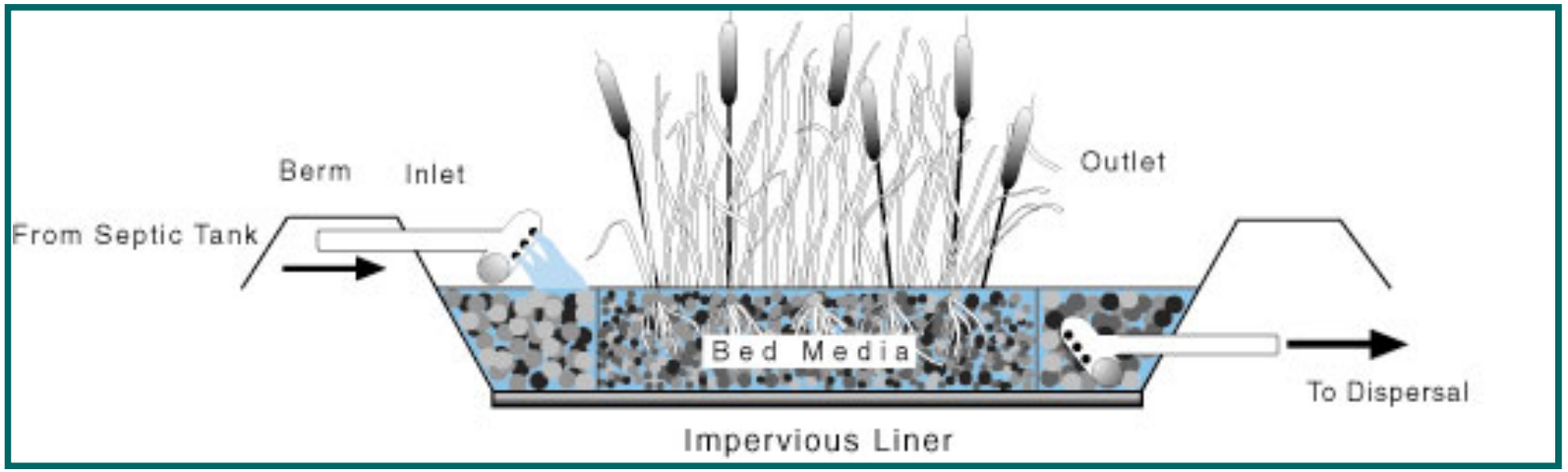
Textile Filter

Re-circulating Media Filter



Constructed Wetland

- **How does it work?**
  - Effluent flows horizontally past roots of plants
  - Aquatic plants filter nutrients and pathogens
  - Anaerobic and aerobic organisms help



Constructed Lined Wetland

SuperAmerica Store, Ham Lake:

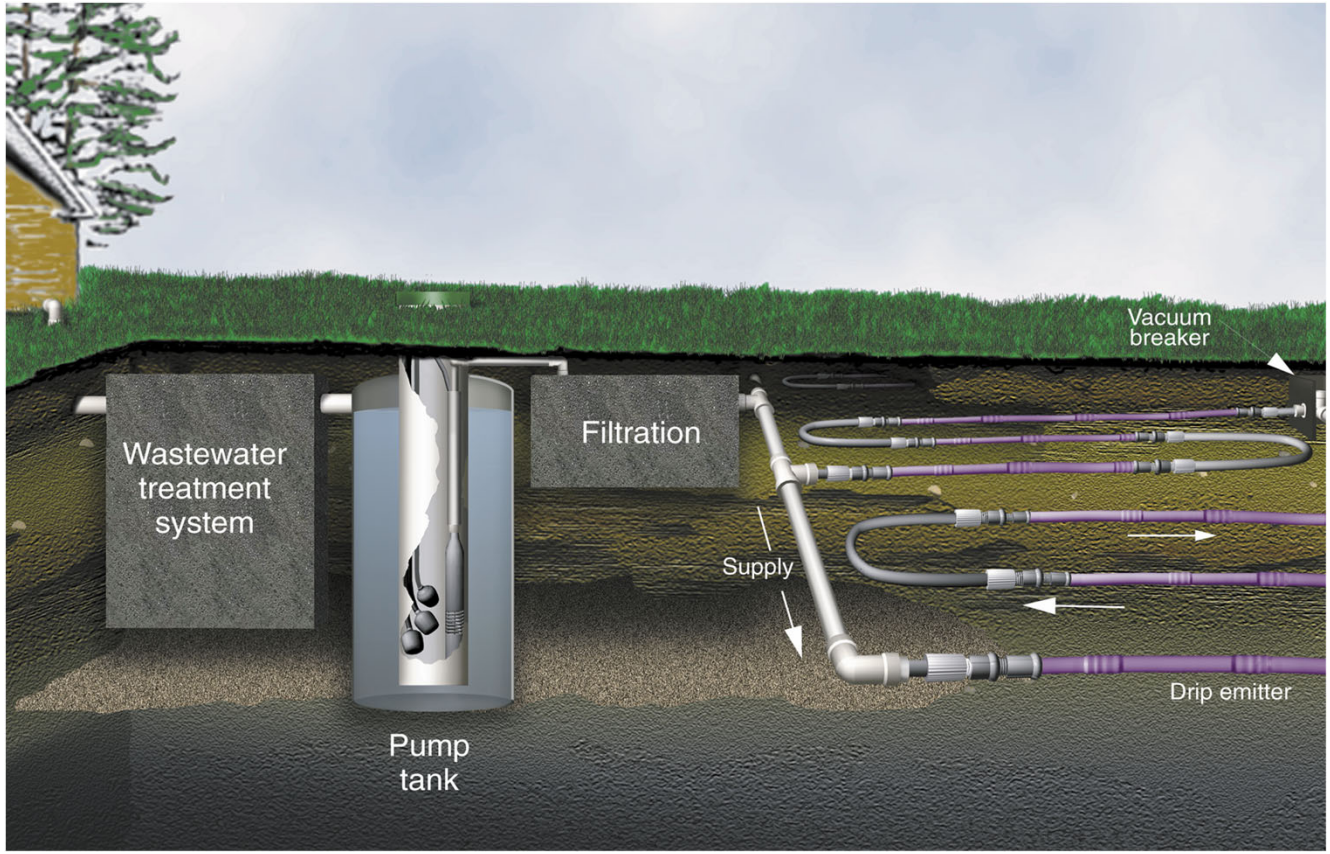
Pre-treatment

Sewage Garden

Final Dispersement

- **Soil based methods**:
  - Standard drainfields or mounds
  - Drip distribution
    - pressurized distribution network – similar to underground irrigation
    - Usually plowed in 12” deep
    - Cost of drip alone upwards of $4,000 - $5,000
    - May be surface or sub-surface
- **Surface water methods**:
  - Discharge to lake or stream using methods such as UV to complete treatment.

Drip Layout


Vacuum breaker
Wastewater treatment system
Filtration
Supply
Drip emitter
Pump tank


Drip Dispersal


Alpha, MN
Individual tanks, shared mound systems.

Working with Professionals

- **The more specifically you can define your needs, the more likely you are to get what you need.**
- ***You* – the community drives the process**
- ***Evaluation Criteria for Assessing Engineering Firms handout***

  - Engineers
  - Consultants
  - Regulators
  - Community Planner
  - Economic Development Advocate
  - City Administrator
  - Educator/Researcher

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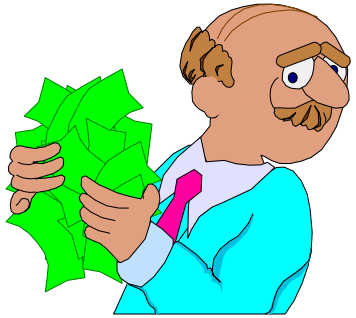
Bias and 'self interests'

- "Many professionals may be biased toward particular technologies, so they may not seriously consider options they are unfamiliar with or simply don't like". *

*Assessing Wastewater Options for Small Communities - National Environmental Training Center



- Everyone has some bias and vested interest in the outcome of a project -

  Professionals & Residents!

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Organizational Structures

- Sanitary District - M.S. 115, 116A
- Regional Sanitary Sewer District
- Special Legislative District
- Subordinate Service District - County & Township
- Lake Improvement District
- Municipality
- Homeowner & lake association
- Joint Power Agreement
- Rural Water District
- Watershed Management Organization
- Watershed District
- Water Quality Cooperative
- Private Agreements

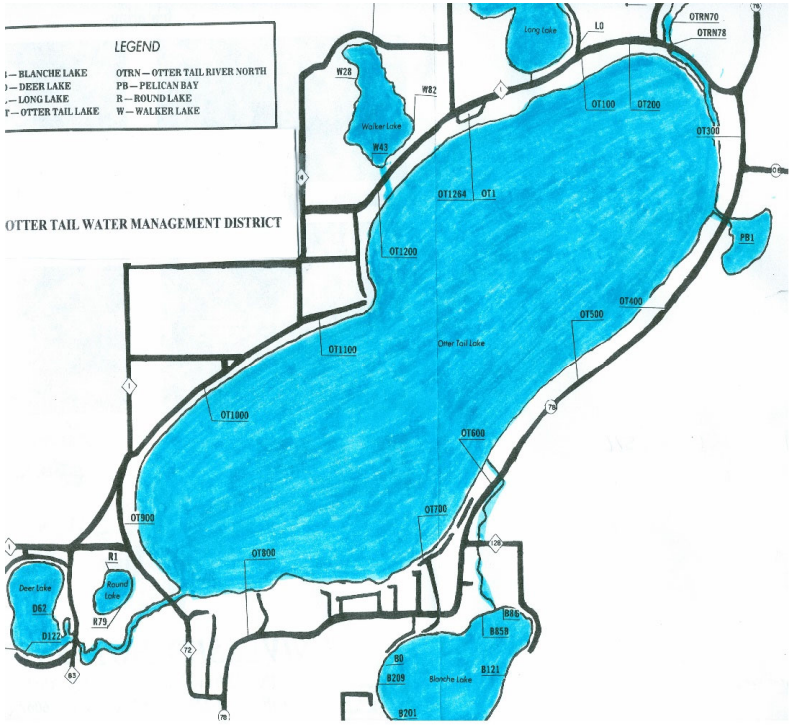
Management

- Establish or review a legal entity to provide operation and management services –
  - City Administration
  - Subordinate Service District or
  - Sanitary Sewer District
- Operating Permits
- Monitoring Plan
- Mitigation plan required along with flow measurement
- System evaluation and reporting critical to long term performance of system
- **Secure a management service provider**

Otter Tail Water Management District

(Sanitary Sewer District – M.S. 116A, 1971)

- 55 square miles
- 6 lakes
- 4 townships
- Part of City of Otter Tail
- Seasonal & permanent residents
- 1984 - 1200 homes, cabins, businesses
- Today - 1545 connections
- Individual & 16 cluster systems using standard technologies



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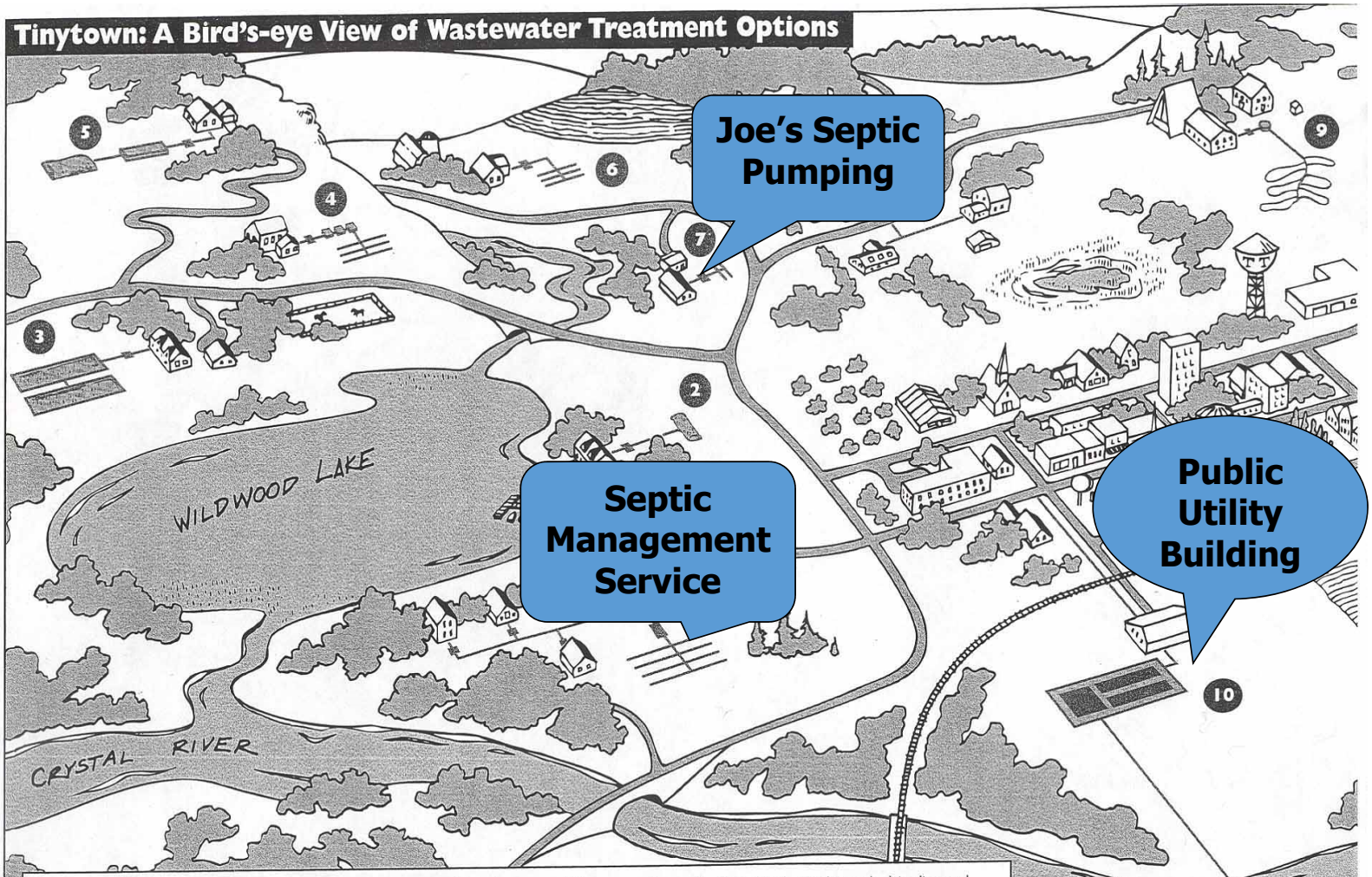
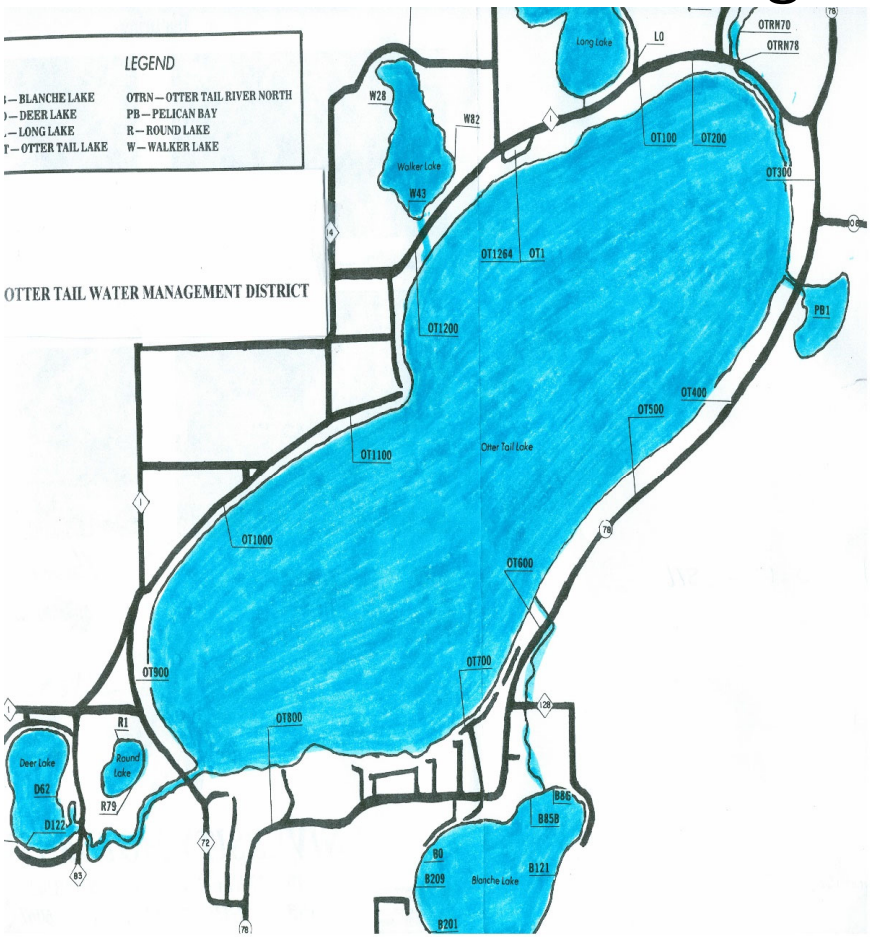

Tinytown: A Bird's-eye View of Wastewater Treatment Options
Joe's Septic Pumping
Septic Management Service
Public Utility Building
WILDWOOD LAKE
CRYSTAL RIVER
DECENTRALIZED
1. Septic tanks, rock trench
2. Septic tank, mound
3. Septic tank, lined wetland, unlined wetland
4. Septic tank, peat filters, chamber trenches
5. Septic tank, single-pass sand filter, mound
6. Septic tank, gravelless trench
7. Dual/separation: composting toilets, septic tank, reduced-size drainfield
8. Collection, large septic tank, mounds
9. Septic tank, aerobic tank, drip dispersal
CENTRALIZED
10. Gravity collection, stabilization ponds, discharge to stream

Community Examples: Management

- **Otter Tail Water District:** (unincorp)
  - Otter Tail County
  - 50+ square mile area
  - 4 Townships
  - Shore land zones around 6 lakes
  - 1543 systems on homes, cabins and businesses
  - 13 cluster systems
  - Established in 1984
- Options:
  - Individuals:
    - Passive Plan
    - Active Plan
  - Multi-household & businesses:
    - Active Plan
- Results:
  - Low failure rates (<5%)
  - Lakes are clearer
  - Realtors like selling in District
  - Low cost to residents
    - $140,000 annual budget

Otter Tail Water Management District



- Offer owners 2 options:
  - Passive Plan
  - Active Plan
- Manages individual onsite systems and cluster systems.

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Passive Maintenance Program

- System is under District jurisdiction
- HO responsible for all maintenance & repairs
- District inspects tanks for pumping, drain field failures, lift pump operation
- District notifies HO to pump & provides reply form when completed
- Can switch to 'active' plan
  - criteria to meet
- Maintain records/history of system
- Information/education on user "best management practices"

Active Maintenance Program

- District:
  - Inspects tanks for pumping, drain field failures, lift pump operation
  - Maintains records/history of system
  - Provides information/education - “best management practices”
- District maintains from the tank & beyond
  - Pumping & repairs to drain field and lift
  - Unless HO is negligent (excessive water use, modifying/damaging system
  - Changes other than normal maintenance & repairs are at owner’s expense
- District replaces system if it fails
- Cannot switch to ‘passive’ plan

Maintenance Service

- Includes – tanks, lifts, STA
- Permanent residences – every 2 years
- Seasonal residences – every 3 years

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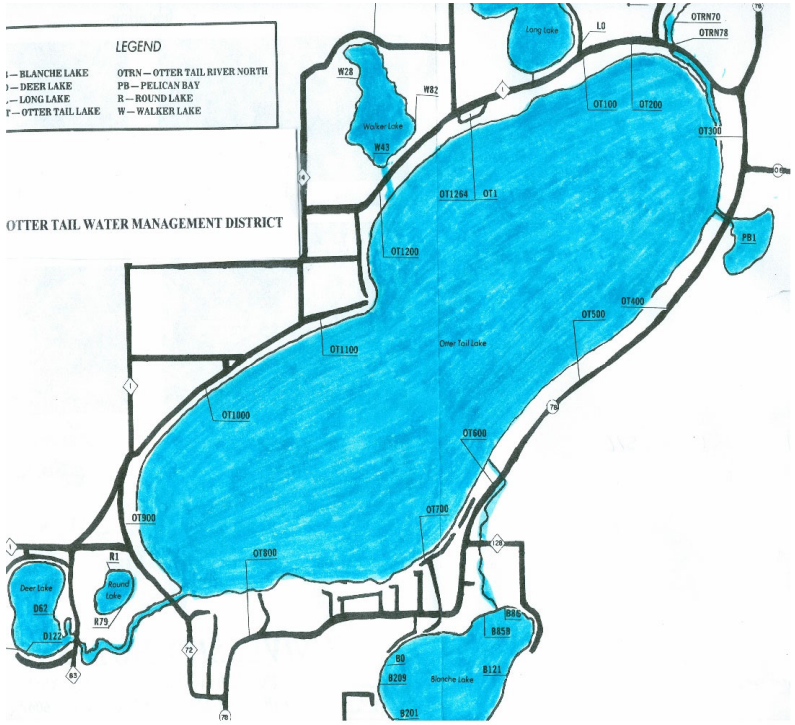
Otter Tail Water Management District



Results: 20 years

- Low failure rates – 1.1%/year (1.6/syst.)
- Lakes are clearer & P levels are lower
- Groundwater protected
- High property values
- Low cost ($36 - $196/yr) for residences
  - $140,000 annual budget
- Kept ‘rural’ character

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Citizens of communities that succeed …

- Clearly understand their current situation ***before*** they start looking for solutions
- Know that only they can make the best decisions for their community
- Take responsibility for and ownership of the problem
- Have or develop members with strong leadership abilities
- Have a clearly defined vision and mission, and set appropriate goals

Citizens of communities that succeed …

- Take the time and energy to identify and examine all options before making decisions
- Gather information from as many sources as possible before taking action
- Keep all affected parties involved and informed all along the way
- Identify criteria for making decisions and use all identified criteria.

Communities do not succeed …

- When a small group makes the decisions and expects everyone to agree – and pay the bill
- When the community lets engineers, consultants or funding sources dictate their choices
- Result in chaos, bickering among neighbors, elected officials getting "un-elected," and a loss of sense of community.

Communications, Outreach

- Make sure all interests and “sides” receive equal information
- Utilize every public route available: local weekly newspapers, local radio, flyers on bulletin boards
- Establish a bulletin board devoted to this issue in a place people regularly go – gas station, grocery store, local school, meeting place, etc. Keep current info there
- Establish a way for residents to contact committee members easily, and in a comfortable manner
- Reach every resident regularly – at least BEFORE major action is taken via newsletter or personal contact
- Phone trees still work

Keys to Success

- A community 'vision' or plan
- Civic engagement –
  - Responsibility
  - Ownership
- Setting the appropriate goals:
  - Treatment
  - Affordable
  - Community values/ character
- Effective leadership
- Understanding that all professionals have biases & self interests
- Identify & evaluate all options
- Involve all interests at the table
- Keep everyone informed.

Remember: This is YOUR project
not the county's not the consultants
not the engineers
It belongs to the residents

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Apply the best technology for the situation & manage it!

The Pitfalls of Improper Planning!