



NEBRA 2013 - "From 503 to Infinity!"

Solving Environmental Challenges: Biosolids as a Tool

Mike Van Ham, PAg, RPBio, RPF
President & Principal Environmental Scientist

October 30, 2013

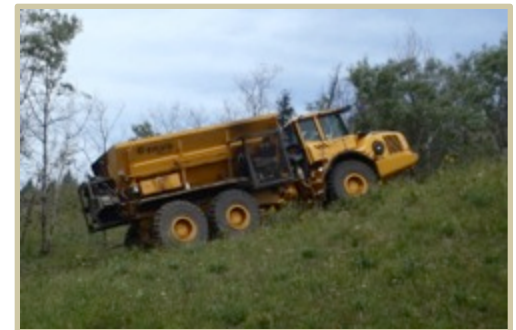
**Solving
Environmental
Challenges:
Biosolids as a
Tool**



SYLVIS

We research, recommend and implement beneficial residuals management

- ✓ Applied research
- ✓ Policy and practices
- ✓ Consultation and education
- ✓ Options assessment and development
- ✓ Operational management



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

Biosolids are not a waste to be managed but a product we make with intent - a tool that can be used to solve environmental challenges now and into the future.

From 503 to Infinity!

Okay - So after this 45 minutes what?

You should appreciate:

- How YOU perceive and present the tool is important
- There are many challenges to be solved – the best ones are not yours

You should know:

- Key attributes in your approach to biosolids management
- Several environmental challenges and biosolids-based solutions
- Examples
- Resources available if you need help

Presentation Outline

Just so you know where we are....

- **Perception**
- Understanding the tool and the challenge
- Building the toolbox
- Example challenges and solutions
- Summary

The Art and Science of Perception

Perception

- "The ability to see, hear, or become aware of something through the senses"
- "The way in which something is regarded, understood, or interpreted" - Oxford Dictionary Online
- Influenced by: past experience, readiness to respond, motivation, emotions, logic/reason, values

What you perceive is real for you...

Differing Perceptions

Biosolids Generators

- Biosolids require management
- Accountable to rate payers
- Contingency/diversity

Biosolids Users

- Benefits – fertilizer, soil amendment
- Solving a challenge

Regulators

- Protection of the health and the environment
- Enable biosolids use

Neighbours

- Quality of life – odour, health, environment
- An advantage?

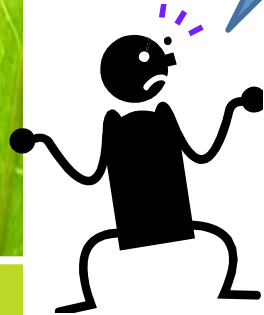
Your Perception

How do YOU see your biosolids? It's important

"Safe"

"Meets regulations"

"Low lead and mercury concentrations"



"Mitigates drought effects and erosion"

"Provides slow release macro and micro nutrients"

"Increases crop yield and tree growth"



Your Perception

Establish and recognize value



Solving Environmental Challenges: Biosolids as a Tool

Your Perception

"Perception is reality"

It's about so much more than biosolids management...



Solve Challenges – Not Just Yours

Not biosolids management projects but...

- Land reclamation programs
- Forest fertilization programs
- Landfill closure programs
- Climate change mitigation programs
- Marginal land improvement programs

Understanding Your Tool & the Challenges

What are their environmental challenges?

- Visual quality
- Crop yield/quality
- Environmental damage
- Regulatory requirements

Ask them



Understanding the Tool & the Challenge

Objectives – know what **you** want

- With your tool in hand, what do you bring to the table?
AKA how can you help?
- Have a vision and niche - ask yourself if the challenge fits
- Build relationships



Develop Relationships

Relationship building

- Understand the needs of the other party – ask them (lots)
- Strive for mutual benefit (synergy)
- Address concerns – take their concerns seriously
- Are you educating, involving, consulting or informing?
- Understand what's going on in their world
- Size matters



Set Realistic Expectations

Good programs take time to build

- Anticipate nervous interest and apprehension
- Ensure you have agency support
- No hasty decisions
- Desperation is rarely appreciated
- Consider lifecycle costing

Communicate

Promoting effective communication

- Establish local "gatekeepers"
- Have a communications plan
- Learn to listen
- Be proactive

"Listening describes an intentional activity – hearing is something that happens without any intentional effort."

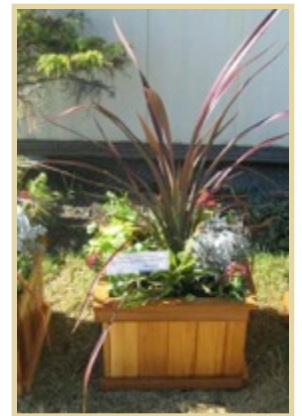
Solving
Environmental
Challenges:
Biosolids as a
Tool



Put Your Best Foot Forward

You only have 1 chance to make a first impression

- No acronyms
- Be approachable
- Create the opportunity for dialogue
- Don't expect them to be interested in biosolids
- Realize that your challenges are your own
- Recognize accomplishments (awards)



Presentation Outline

Just so you know where we are....

- ✓ Perception
- ✓ Understanding the tool and the challenge
- **Challenges, possible solutions and examples (case studies)**
- Summary

So How Does This All Go Together?

 **Challenges**

 **+ Biosolids**

 **= Solutions**

Examples

Where?



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

#1 - Carbon

Challenge		Solution
1A	Too Much Carbon <ul style="list-style-type: none">• Climate change – greenhouse gas (methane) emissions	<ul style="list-style-type: none">• Bacteria – methane oxidation
1B	Not Enough Carbon <ul style="list-style-type: none">• Lack of feedstock for composting or soil fabrication	<ul style="list-style-type: none">• Short rotation woody crops

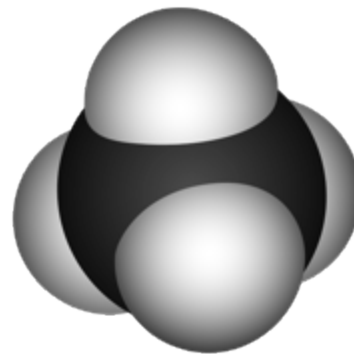
Challenge #1A – Too Much Carbon

Greenhouse gases

- Global warming potential – large effect
- Human health and safety risks – methane contamination, explosion risk

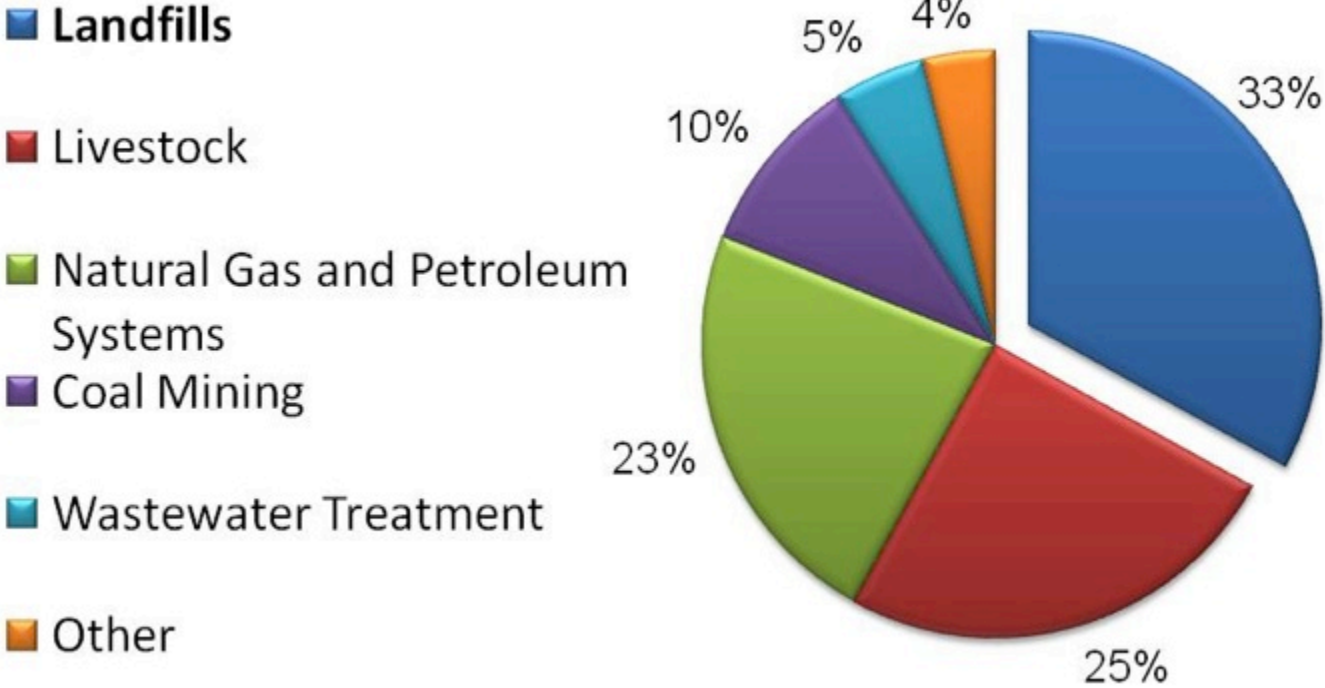
Risk mitigation

- Methane oxidation



Challenge #1A – Too Much Carbon

Anthropogenic methane sources



Solution #1A – Biocover

Biocover

- Engineered soil with special characteristics
- Biosolids use in creating a cover or biofilter for methane oxidation
- Use on active or closed landfills



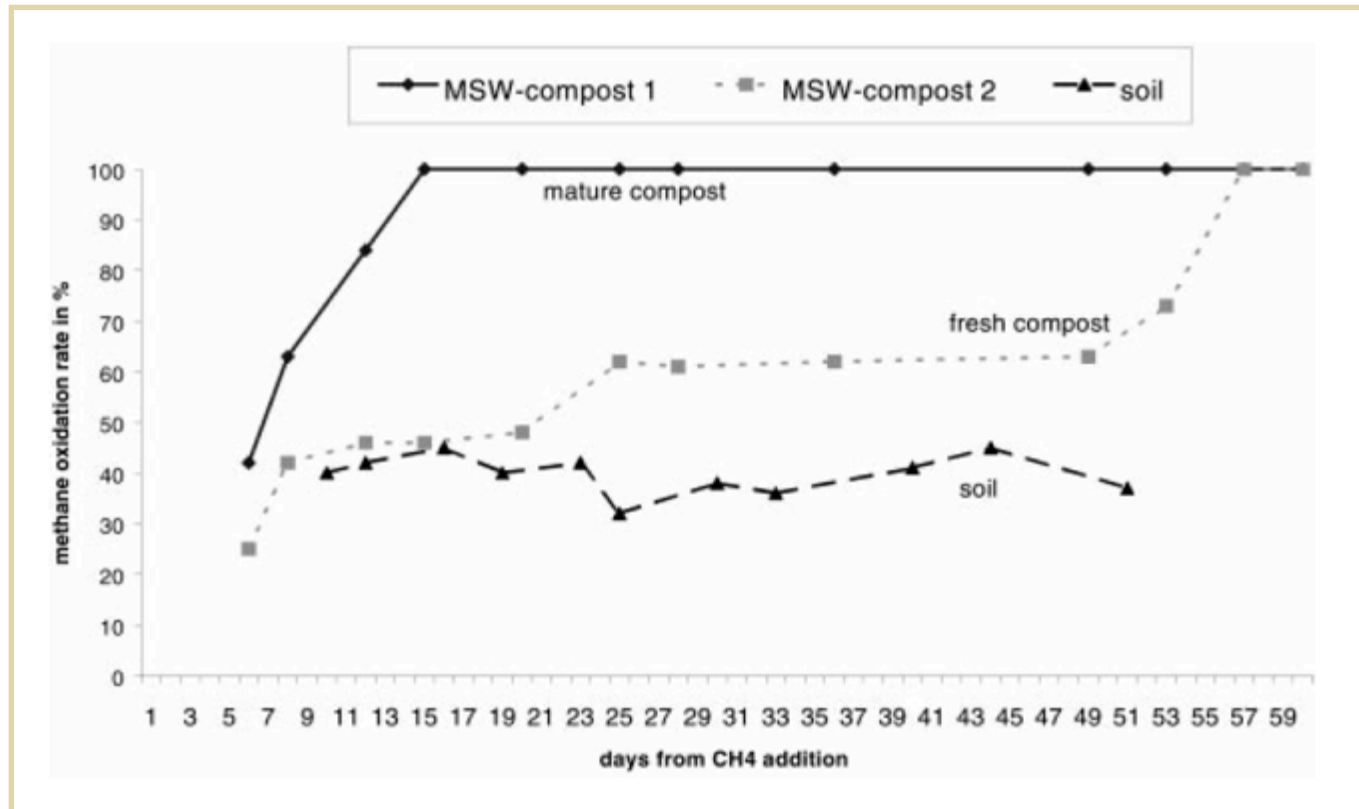
Solution #1A – Biocover

Important Considerations

- Good porosity
- Moderate pH (6.5-8.0)
- 20-30% soil moisture
- High levels of organic matter
- Temperature
- High C:N
- Atmospheric pressure



Current Research (Humer & Lechner, 1999)



Methane oxidation rate of various composts and a soil

Example #1A – Ecowaste Industries



Solving Environmental Challenges: Biosolids as a Tool



Example 1A - Ecowaste Industries

Biosolids amended soil

- Fabrication
- Placement



Example 1A - Ecowaste Industries

Landfill cover

- Passive methane oxidation
- Closure completed with a gas oxidation system
- Cost savings
- GHG credits

Gas collection system to be installed as warranted



Example 1A – Regional District of Nanaimo

Interim closure system

- Biocover methane oxidation for interim closure
- Fugitive methane mitigation
- Facilitate achieving closure/reclamation goals



Example 1A – Regional District of Nanaimo



Solving
Environmental
Challenges:
Biosolids as a
Tool

Example 1A – Regional District of Nanaimo

Different Biocover Formulations

- Type 1- 1.5:4:4 biosolids:sand:wood
- Type 2- 1:5:7 biosolids:sand:wood
- Methane fluxes from interim closure reduced.....

Location	Flux ($\text{g m}^{-2} \text{d}^{-1}$)		Efficiency (%)
	July	October	
1	31.23	0.30	99.03
2	30.53	2.81	90.79
3	28.03	0.00	100

Challenge #1B – Not Enough Carbon

Lack of carbon for:

- Composting *
- Soil fabrication*

Competition from:

- Co-generation
- Heating
- Agricultural / retail uses (multiple)



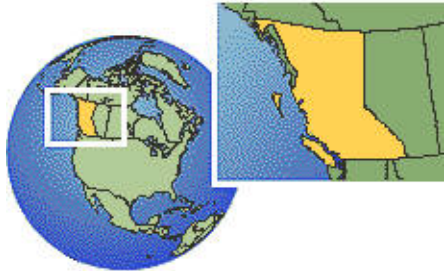
Solution #1B – Biomass Plantations

Biomass plantations

- Coppice willow, hybrid poplar
- Short rotation wood farming
- Carbon sequestration in soil and biomass



Example #1B – BC and Alberta



Solving Environmental Challenges: Biosolids as a Tool



NEBRA 2013 - "From 503 to Infinity!"

Example #1B – BC



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

 **SYLVIS**

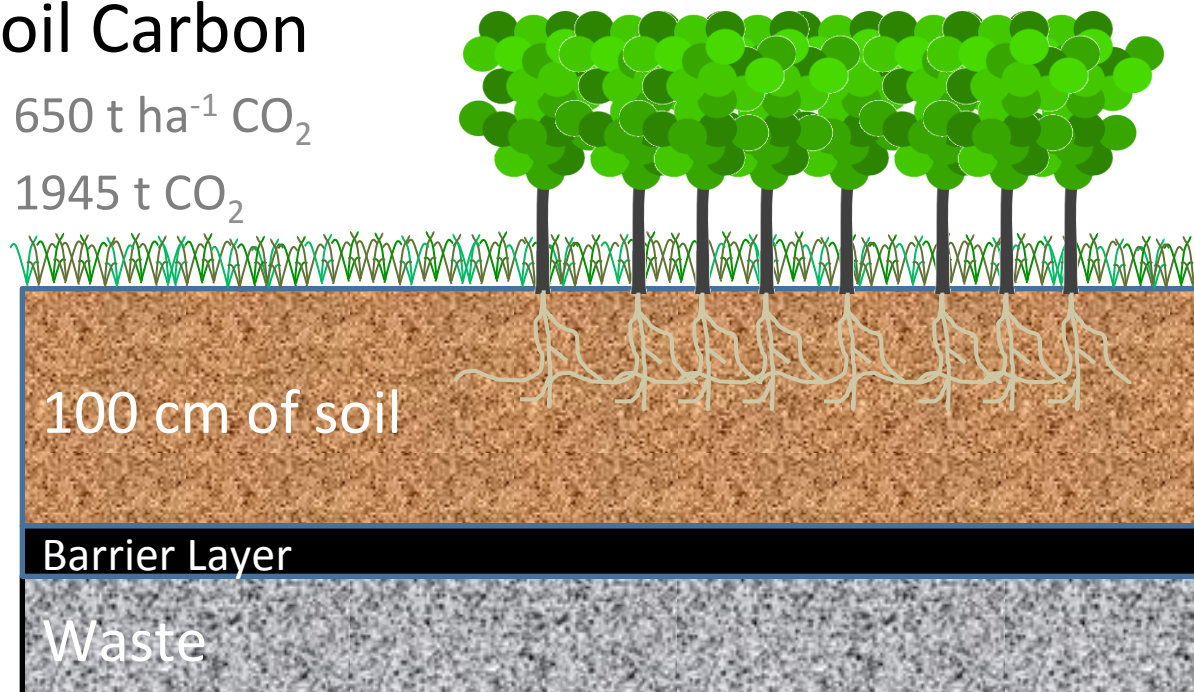
Example #1B - Ecowaste Industries

Biomass content of plantation at maturity

- 100 t ha⁻¹ CO₂
- 300 t CO₂

Soil Carbon

- 650 t ha⁻¹ CO₂
- 1945 t CO₂



Example #1B –Alberta



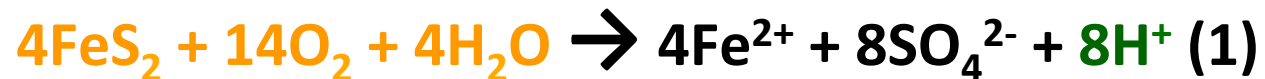
Area of biomass plantations as compared to the area of Central Park

**Solving
Environmental
Challenges:
Biosolids as a
Tool**

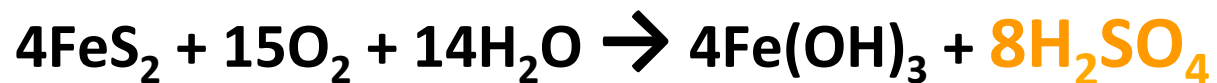
#2 – Water Quality

Challenge		Solution
2A	Acid Rock Drainage <ul style="list-style-type: none">• Low pH• Environmental damage	<ul style="list-style-type: none">• Barrier and treatment
2B	Landfill Leachate Management <ul style="list-style-type: none">• Ammonia toxicity• Development opportunity lost	<ul style="list-style-type: none">• Terrestrial treatment system
2C	Salmon Habitat Degradation	<ul style="list-style-type: none">• Sedimentation barrier / storm water retention

Challenge #2A – Acid Rock Drainage



NET REACTION:



Solution #2A – Barrier and Treatment

Custom biosolids reclamation mix

- Use of biosolids as a component of a biosolids fabricated soil was identified as an option to achieve reclamation goals concurrent with mitigation of acid rock drainage.



NEBRA 2013 - "From 503 to Infinity!"

Example #2A – Monteith Bay Quarry



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

 **SYLVIS**

NEBRA 2013 - "From 503 to Infinity!"



**Solving
Environmental
Challenges:
Biosolids as a
Tool**



Example #2A – Monteith Bay Quarry



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

Example #2A – Monteith Bay Quarry



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

Challenge #2B – Landfill Leachate

Considerations

- Discharge to surface water
- Ammonia
- Volume
- Final land used mixed: industrial and agricultural



Solution #2B – Terrestrial Treatment System

Soil/Plant Treatment System

- Use of biosolids and other residuals (wood waste, dredge sand) to create a fabricated soil
- Vegetation (trees, grasses) take up nutrients and moisture



Example #2B – Ecowaste Industries



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

Example #2B – Ecowaste Industries



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

Challenge #2C – Salmon Habitat Degradation

Road erosion with habitat impacts



Solution #2C – Sedimentation Barrier

Biosolids based sedimentation interception



Solving
Environmental
Challenges:
Biosolids as a
Tool

NEBRA 2013 - "From 503 to Infinity!"

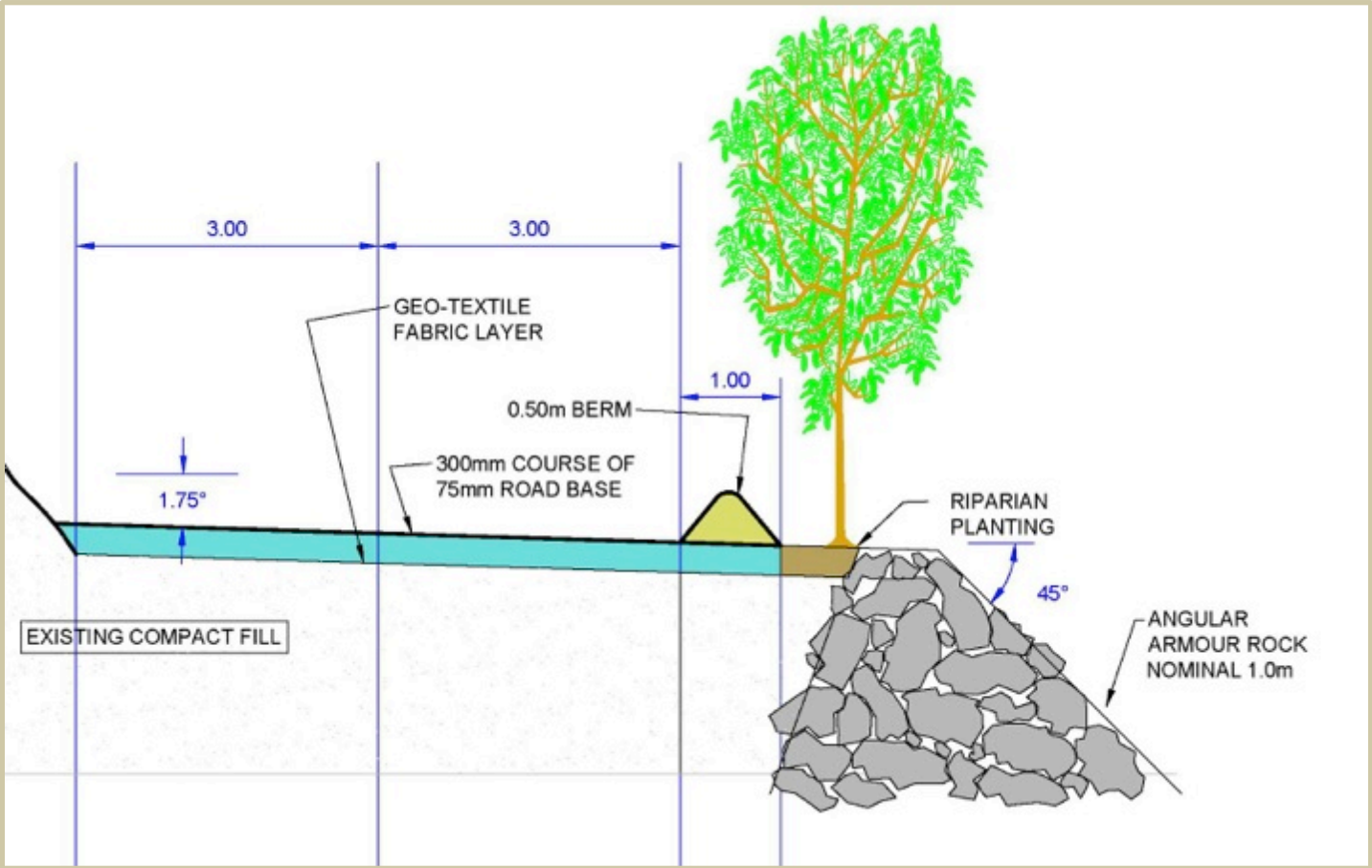
Example #2C – Watts Point



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

 **SYLVIS**

Example #2C – Watts Point



Solving Environmental Challenges: Biosolids as a Tool



Example #2C – Watts Point



Solving
Environmental
Challenges:
Biosolids as a
Tool

#3 – Land Management

Challenge		Solution
3A	Disturbed and Degraded Sites <ul style="list-style-type: none">• Reclamation requirements• Land owner objectives	<ul style="list-style-type: none">• Biosolids fertilization?

Challenge 3A – Disturbed Sites

Characteristics

- Highly disturbed lacking nutrient capital
- Vegetation establishment difficult
- Large scale (often)
- Lack of familiarity with organic (i.e., non-chemical) fertilizers
- Susceptible to erosion
- Conventional reclamation practices not achieving objectives

Challenge 3A – Disturbed Sites

Reclamation permit requirements

- “Return land to equal or greater productivity”
- Complete a reclamation plan
- Undertake reclamation
- Inspectors assess reclamation
- Transfer of responsibility with accepted reclamation

Solution 3A – Biosolids Fertilization?

Mine manager's challenges

- Reclamation requirements
- Limit mine access
- Habitat creation/diversification
- Improved visual quality
- Local training and employment
- Timely revenue generation
- Onsite water management
- Slope stability and minimize erosion
- Minimize community impacts



Example #3A – Lehigh Sechelt

Canada's largest sand and gravel mine

- 6 million tonnes of aggregate per year
- 250 hectares
- Serves local and international markets



Example #3A – Lehigh Sechelt



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

Example #3A – Lehigh Sechelt



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

NEBRA 2013 - "From 503 to Infinity!"

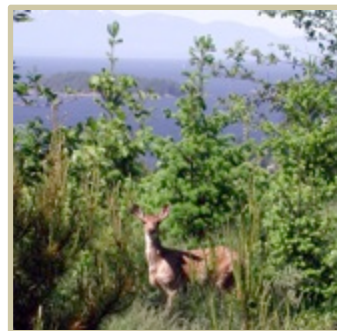
Example #3A – Lehigh Sechelt



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

 **SYLVIS**

Example #3A – Lehigh Sechelt



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

NEBRA 2013 - "From 503 to Infinity!"

Example #3A – Lehigh Sechelt



**Solving
Environmental
Challenges:
Biosolids as a
Tool**

 **SYLVIS**

So did you get it all?

Key points

- Perception is reality – yours and theirs
- Biosolids are a tool
- Become embedded in achieving a solution
- Measure your success on this achievement
- Demonstrate the importance/significance of the outcome (it is not about you but what they have achieved)
- **Become a superhero solving environmental challenges**

Any Questions



Mike Van Ham, SYLVIS

Phone: 604.777.9788

Email: mvanham@sylvis.com

**Solving
Environmental
Challenges:
Biosolids as a
Tool**

