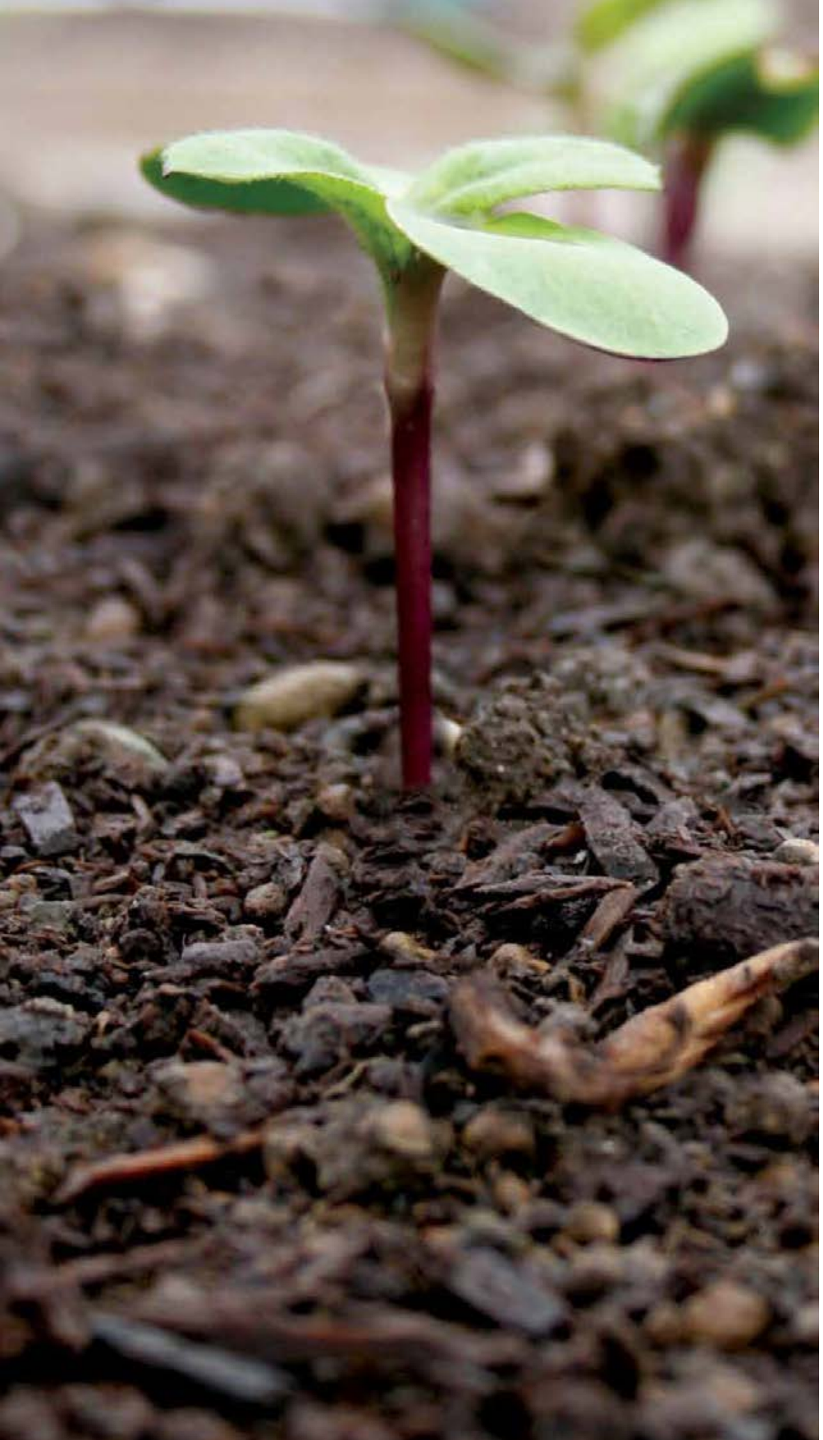

Biosolids Process
(in preparation for July field trip)

Presented to:
MWPAAC Engineering and Planning Subcommittee
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Biosolids are a Beneficial Soil Amendment

- Increases soil organic matter
- Adds macro- and micro-nutrients
- Improves soil structure
- Enhances water retention
- Stimulates plant growth
- Reduces erosion

Regulatory Support for Beneficial Use

- Federal and state regulations
  - operational standards
  - pollutant limits
  - management practices
- Goal: support beneficial use while maintaining or improving environmental quality and protecting public health.

Class A versus class B

Class A:

- 100% of pathogens are destroyed
- Unrestricted use
- Lime stabilization, composting, & heat processing are common methods to get Class A
- Used by farmers & home gardeners

Class B:

- 95-99% of pathogens are destroyed
- Most biosolids in WA state are Class B
- Permitted use only
  - Public notification
  - Harvest waiting periods
- Typically only used by commercial farmers

GROUNDED IN RIGOROUS SCIENCE

- For over 40 years we've built on EPA and other national data by teaming with university scientists to continuously research and monitor the safety and efficacy of Loop.
  - Metals
  - Pathogens
  - Pharmaceuticals and related compounds

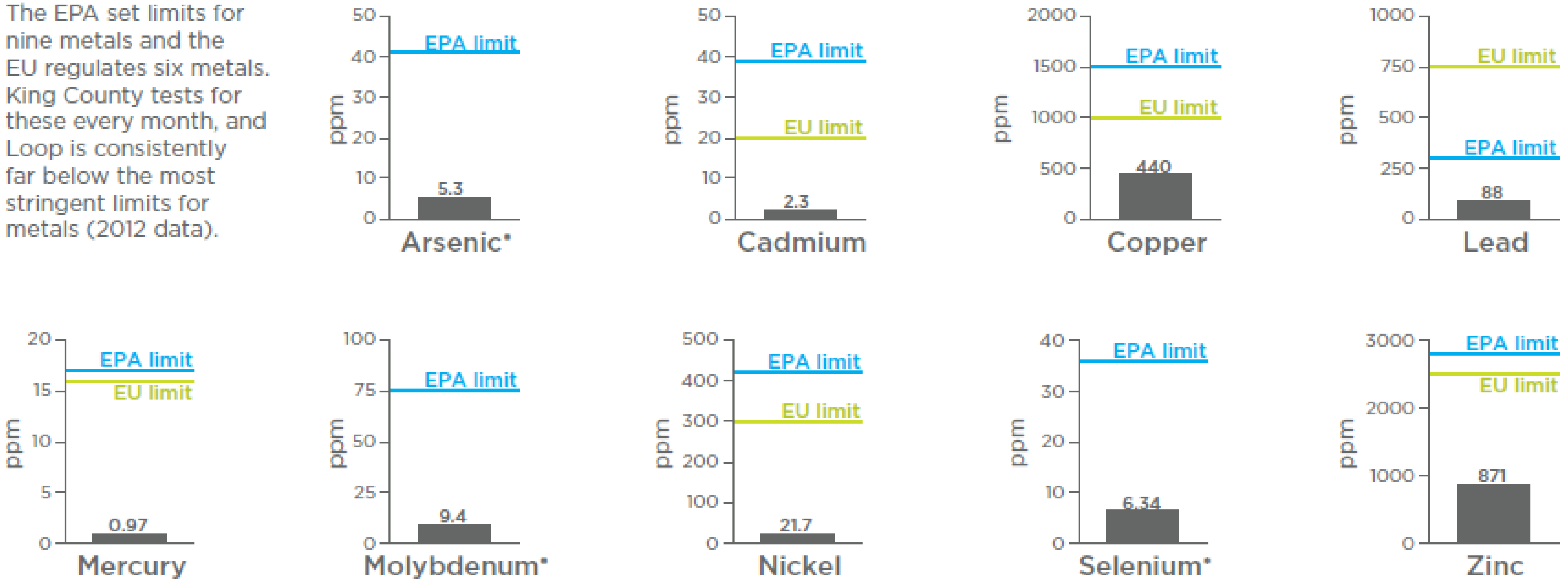
Metals research:

- Plant uptake
- Movement in soils
- Direct ingestion

Metals: regulatory safety limits compared to Loop

Metals in Loop compared to the most stringent U.S. Environmental Protection Agency (EPA) and European Union (EU) limits

The EPA set limits for nine metals and the EU regulates six metals. King County tests for these every month, and Loop is consistently far below the most stringent limits for metals (2012 data).



* No EU limit

Studies on the ability of biosolids to bind metals resulted in use by EPA to reclaim metal-contaminated sites (e.g., mine tailings and smelter plumes)

EPA

www.cluin.org/ecotools

Using Soil Amendments

FACILITATING SITE REMEDIATION, REVITALIZATION, AND REUSE

Superfund sites and other sites with contaminated or disturbed soils exhibit a variety of problems that often can be addressed effectively and directly through the application of soil amendments. The use of soil amendments can be a cost effective in situ process for remediation, revitalization, and reuse of many types of disturbed and contaminated landscapes.

When specified and applied properly, soil amendments limit many of the contaminant exposure pathways and reduce soil phytotoxicity. Soil amendments also can restore appropriate soil conditions for plant growth by balancing pH, adding organic matter, restoring soil microbial activity, increasing moisture retention, and reducing compaction. This fact sheet provides an overview of using soil amendments to address on-site contamination and the resources available to assist with this clean up approach.

DID YOU KNOW?

Technical Assistance for using soil amendments to address contaminated soils is available through Office of Superfund Remediation and Technology Innovation (OSRTI). For more information, please contact Michele Mahoney by phone at 703-603-9057 or by e-mail at mahoney.michele@epa.gov.

What are soil amendments?

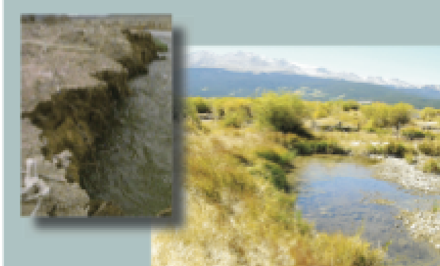
Soil amendments are materials added to soils in order to improve soil quality and establish plant growth. Soil amendments may be inorganic (e.g., liming materials), organic (e.g., composts) or mixtures (e.g., lime-stabilized biosolids). Commonly used soil amendments include:

- municipal biosolids, such as water treatment residuals;
- animal manures and litters;
- sugar beet lime;
- wood ash;
- foundry sands, steel slag, or dredged materials;
- log yard waste;
- residential yard waste;
- ethanol production by-products;
- neutralizing lime products;
- composted biosolids; and
- a variety of composted agricultural byproducts, as well as traditional agricultural fertilizers.

Why is using soil amendments effective?

Soil amendments can reduce the bioavailability of a wide range of contaminants, such as inorganics, while simultaneously enhancing revegetation success and, thereby, protecting against offsite movement of contaminants by wind and water. As such, they can be used in situations ranging from time critical contaminant removal actions to long-term ecological revitalization projects. Using residual materials (industrial byproducts) as soil amendments offers the potential for significant cost savings compared to traditional alternatives. In addition, land revitalization using soil amendments has significant ecological benefits including wildlife habitat, species diversity, food control, aesthetics, and recreation.

Notes from the Field



At the California Gulch site in Leadville, Colorado, tailings along the Upper Arkansas River had low soil pH and elevated concentrations of metals. Lime was used to amend the soil pH and biosolids were applied to the tailings. A wide range of earthworm, fish, and small mammal testing was conducted to determine whether the revitalized habitat was creating an attractive nuisance. Results showed that the bioavailability of the heavy metals present on the site was dramatically reduced after being treated with soil amendments and wildlife exposure was within acceptable limits.

U.S. Environmental Protection Agency
Office of Superfund Remediation and Technology Innovation

Pathogens in biosolids: regulations

Class A

- complete pathogen kill
- unregulated use
- (e.g., GroCo, Tagro)

Class B

- majority of pathogens killed,
- use restricted
  - Public notice
  - Harvest restrictions
- (e.g., pure Loop)

Table 6. Community risks of infection associated with indirect pathogen contact from three indirect exposure scenarios from animal manures and biosolids that are transported off-site[1,2,3] following land application of the residual. Data presented as chance of infection per exposure (NA = nonapplicable, as there is no data to suggest pathogen's presence in the residual).

	Risks from single indirect exposures to manures or biosolids (per 10,000)			
Pathogen	**Cattle or Cow Manure**	**Poultry Manure**	**Swine Manure**	**Class B[4] Biosolids**
Campylobacter jejuni	≤ 0.0002	≤ 0.008	≤ 0.009	≤ 0.00001
E.coli O157:H7	≤ 0.00001	NA	NA	NA
Listeria monocytogenes	≤ 0.00001	≤ 0.00001	≤ 0.00001	≤ 0.00001
Salmonella	≤ 0.00001	≤ 0.00001	≤ 0.00001	≤ 0.00001
Cryptosporidium	≤ 0.00001	NA	NA	≤ 0.00001
Adenovirus	NA	NA	NA	≤ 0.002
Coxsackievirus	NA	NA	NA	≤ 0.00009

[1] Assumes 292 g food-crop consumed on a one-time exposure from plots amended with residuals and food-crop harvested four months after residual land application.

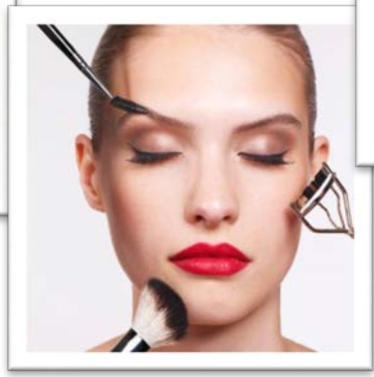
[2] Assumes runoff transport of residual-borne pathogens to an adjacent food-crop field and subsequent crop ingestion.

[3] Assumes aerosol risks during land application of the residual to a population located 100 m downwind of the site and 10% ingestion of inhaled aerosols.

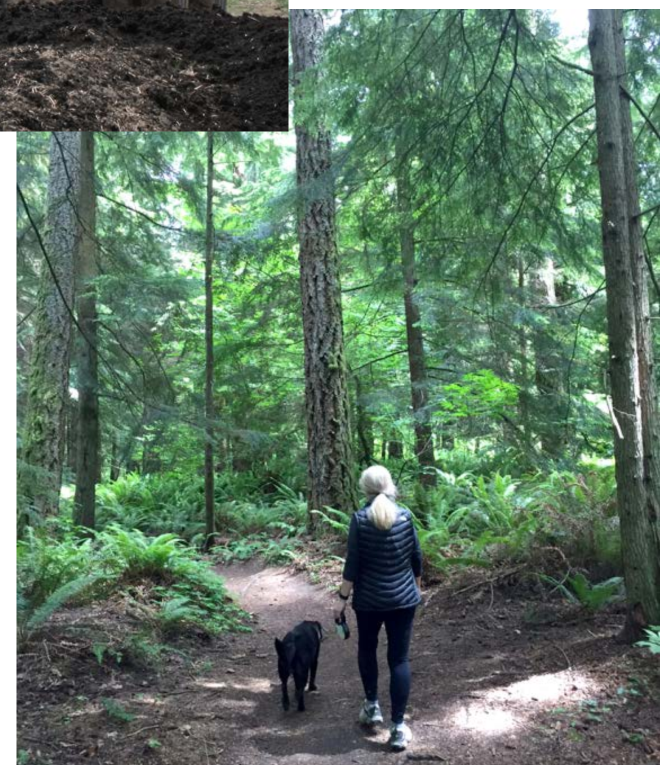
[4] Class A biosolids are assumed to be pathogen free and hence risks are below those presented above for Class B biosolids.

American Society for microbiology, 2011

Pharmaceuticals and related compounds

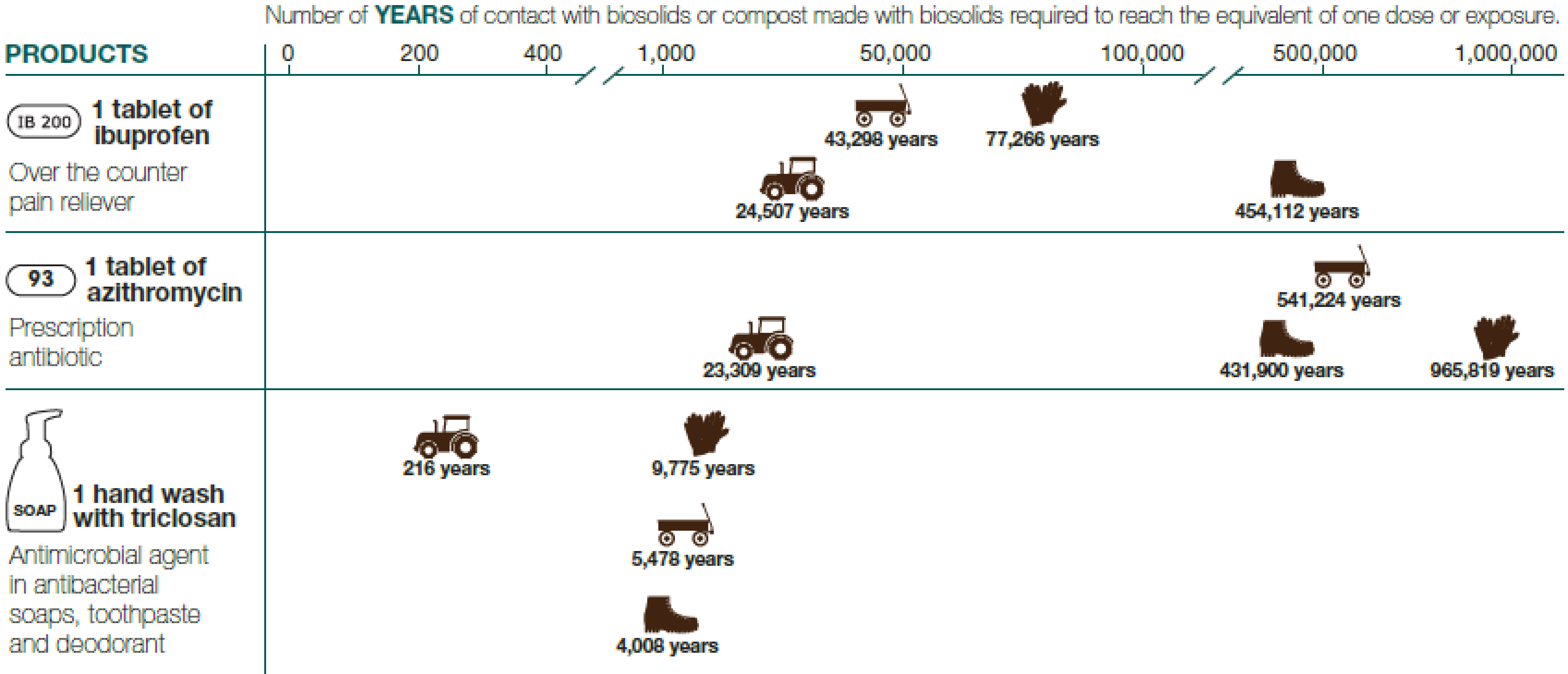



DEERE



WHAT'S THE RISK?

It would take many lifetimes of working or playing around biosolids or compost made with biosolids to equal everyday exposure to many common products.



WHAT IS A RISK ANALYSIS?

A risk analysis estimates the risk to human health by examining how harmful a chemical is (toxicity) and the amount of contact with that chemical (exposure).

RISK = TOXICITY x EXPOSURE

Chemicals with high toxicity and high exposure have higher risk, while chemicals with low toxicity and low exposure have lower risk.

This risk analysis followed the United States Environmental Protection Agency (U.S. EPA) risk assessment methodology.

WHAT ABOUT FOOD?

For this analysis, wheat fertilized with biosolids was tested for over 80 compounds in pharmaceuticals and personal care products and none were found in the wheat grain.

Class A Biosolids

- Class A biosolids generally achieved by time/temperature relationship
- KC WTD biosolids currently processed at ~98F (37C) for 20 to 30 days (Class B)
- Class A biosolids generally processed at minimum of ~130F (55C) for 10 to 20 days
- Class A digestion processes often require a batch-feed step (not continuous feed)
  - Guarantees full contact time for all solids

Class A Technology Summary

Class A Technology	Characteristics
Thermal Drying	High O&M cost; Potential odor source; Pelleted or Granular product; (e.g., Boston, Chicago, Alderwood WWD/Picnic Point, Tacoma/Chambers Creek)
Temperature Phased Anaerobic Digestion (TPAD)	Relatively low O&M cost; Relatively low odor; "Loop-like" product; (e.g., Duluth, Chattanooga, Omaha)
Thermal Hydrolysis (Cambi)	Relatively high capital cost; increased biogas production/reduced solids production; "Loop-like" product, (e.g., DC Water, Europe)
Composting (Offsite)	In-vessel/high rate; Compost product; Net overall savings v H&A[1] program (e.g., Bristol, TN; Hickory, NC)

[1] Assumes 17% of Loop biosolids are delivered to local compost facility with Class A compost product delivered to King County and other western WA markets.

Highlights

- Good source of nutrients & organic matter
- Build soils for long-term soil health & carbon sequestration
- Yields typically meet or exceed inorganic nitrogen fertilizer
- As safe as alternative soil amendments
- Biosolids strategic planning process underway

Questions?

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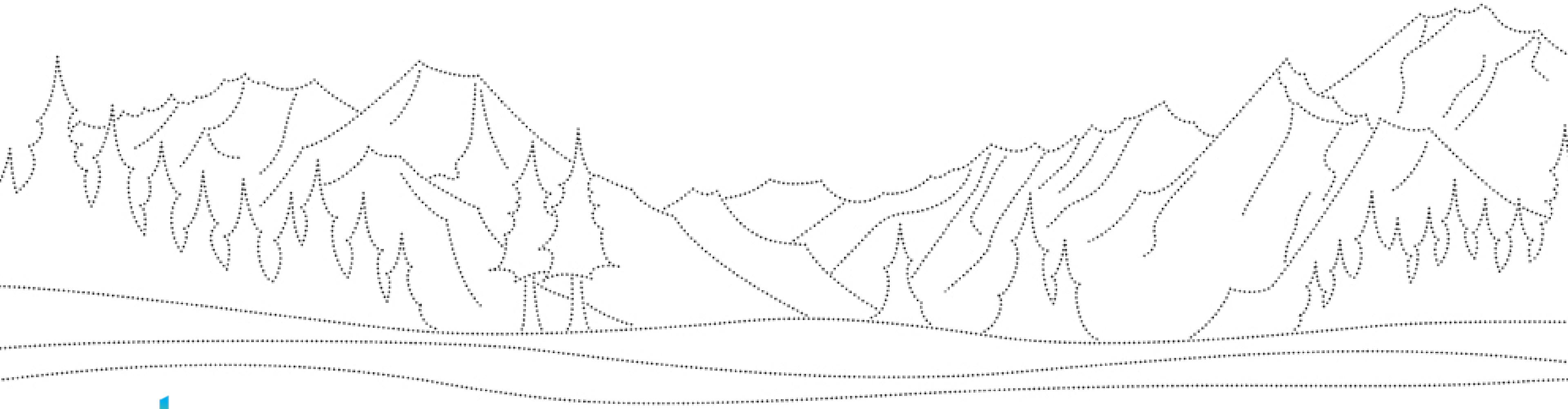

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