2021 Report on Forest Restoration Biomass Products

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Biomass Discussion

- Biomass 101
  - What is it? How much is out there?
  - Current markets
- Landfill Pilot Project
- NAU Efforts (Erik Neilsen)
- Flagstaff Water Group (Robert Vane)

140 years of Fire Suppression Based Forest Management

Top: Fern Mountain 1888 Unknown Photo Credit
Bottom: Walker Lake 2004 taken by Neil Weintraub

Top: Walker Lake 1875 taken by John Hillers
Bottom: Walker Lake 2004 taken by Neil Weintraub

Biomass 101

What is it?

1. Non-Merchantable Product: Green tree stem tops cut at 4-inches in diameter, tree branches, any size tree stem segment under 8 feet long
   - Anything that you cannot make into a 2x4x8 board
2. Pulp Wood: Green tree stems that are 5 – 9 inches in diameter. Not currently considered biomass but USFS contracting specifications are evolving
3. Whole Tree Chips: Entire tree put through a chipper or grinder
   - Clean chips: No bark or needles
   - Dirty Chips: Includes bark and needles
4. Hog Fuel: Mix of everything
5. Other Sawmill Residuals: Wood chips, slabs, bark and sawdust created as a result of the milling process

Slash and Pulp Wood Pile

Biomass 101

How much is out there?

At 50K acres per year of thinning = **2 million green tons**

Equal to the amount of Saw Logs

Current Biomass Markets

Novo Biopower, Snowflake
300,000 green tons per year (14K acres)
27 MW/Hour Electricity (20K homes)
Will take all forms of biomass

Forest Energy, Show Low
100,000 green tons per year (2,000 acres)
Wood Fuel Pellets & Logs, Animal Bedding
Will take Logs and Clean Chips

Gro-Well, Phoenix
65,000 green tons per year (1,300 acres)
Soil, Soil Amendments, Ground Cover,
Fertilizer, Playground Chips, Absorbent
Will take Clean Chips and Bark

Scotts Miracle-Grow, Maricopa
Lawn and Garden Care Products
50,000 green tons per year (1,000 acres)
Will take Clean Chips and Bark

Cinder Lake Landfill, Flagstaff
4,000 green tons per year
100% Used as soil amendment

Additional Markets Needed!!
Increase current market capacity
New power generation facilities
Emerging technologies – Biochar, Torrefaction
Increase community firewood programs

Cinder Lake Landfill

Opportunity:

Investigate emerging waste consumption technologies

Goals:

- Continue efforts that extend the life of the Landfill
- Try to consume current waste materials in a way that provides beneficial outputs
- Develop Feasibility Studies, Request for Proposals and Feedstock Supply Plans (Solid Waste, Sustainability, Water Services and Wildland Fire Management)

Northern Arizona University

Erik Nielsen

Associate Professor, School of Earth & Sustainability

Biomass Utilization Efforts at NAU

Flagstaff Water Group

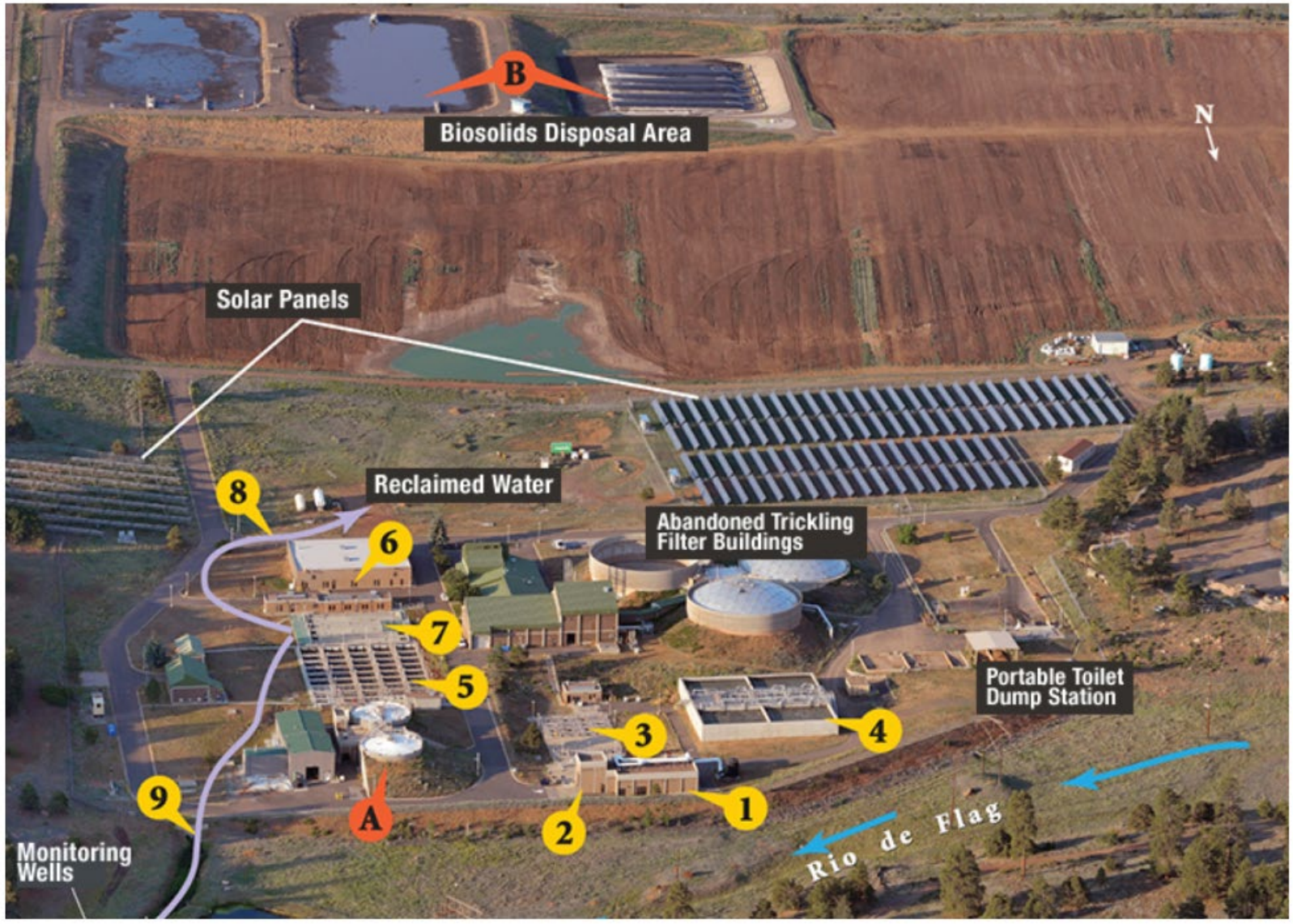
Robert Vane

Safe Disposal of Sewage Sludge:
A Potential Additional Benefit of a Bioenergy Facility

Flagstaff Water Group

Flagstaff's Present Sludge Disposal System

For ~40 years, Flagstaff's sludge from wastewater treatment has been de-watered and then "plowed under" at a 40 acre "Dedicated Land Disposal" (DLD) site adjacent to the Wildcat WRP



Flagstaff Water Group

Present Sludge Disposal System: Risks

- This present land disposal system for sludge is unique in Arizona and is likely unsustainable
- It could be shut down due to chemical contamination:
  - Declaration as a hazardous waste site
  - Percolation of hazardous chemicals to the Coconino Aquifer

Representative Categories of Manmade Chemicals, Most of Which Are Not Regulated or Removed by Conventional Wastewater Treatment Processes	
• Pharmaceuticals • Discarded Medications • Personal Care Products • Herbicides	• Pesticides • Flame Retardants • Industrial Cleansers • Industrial Solvents

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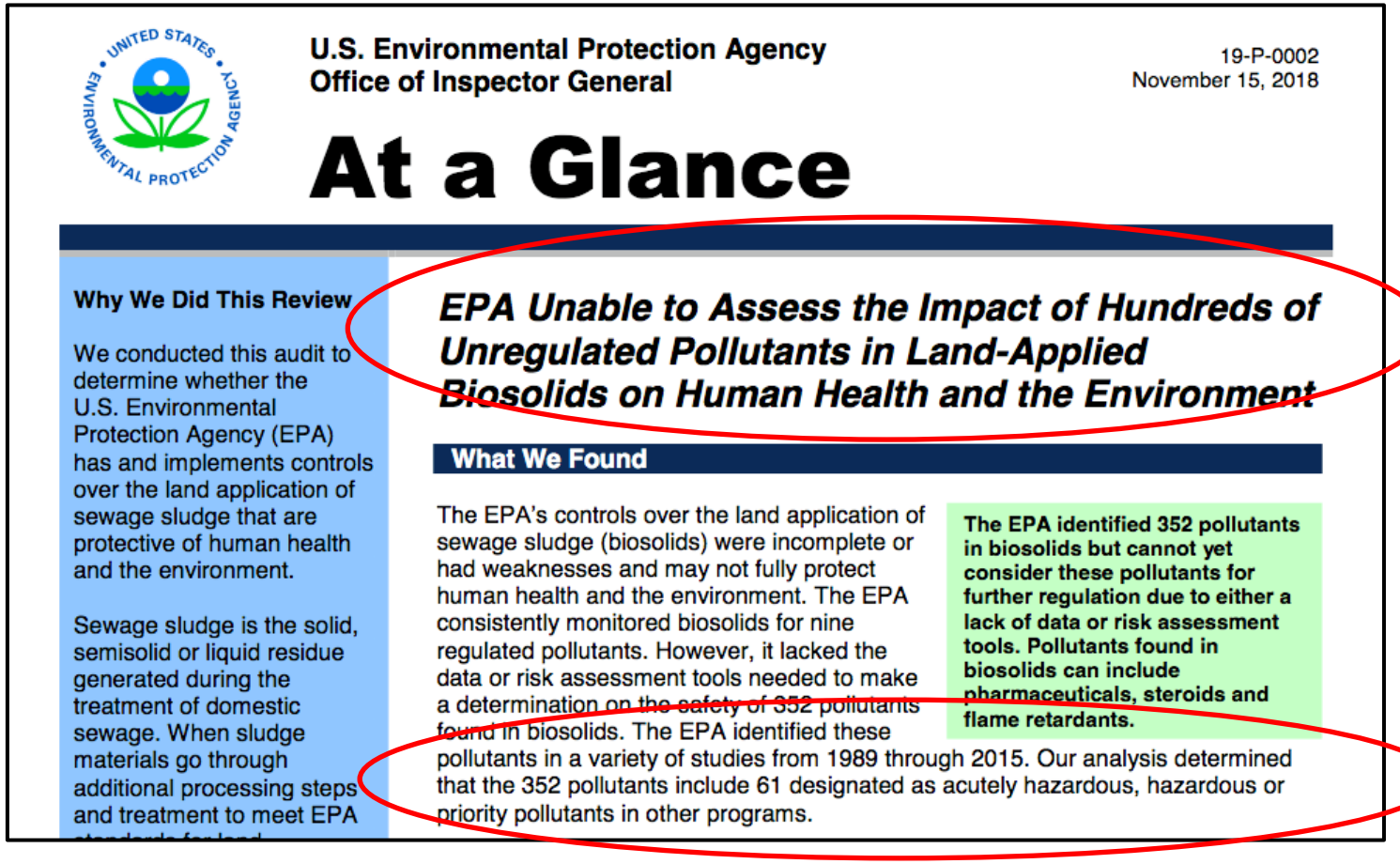
Increased Scrutiny May Be Imminent*



U.S. Environmental Protection Agency
Office of Inspector General

19-P-0002
November 15, 2018

At a Glance

Why We Did This Review

We conducted this audit to determine whether the U.S. Environmental Protection Agency (EPA) has and implements controls over the land application of sewage sludge that are protective of human health and the environment.

Sewage sludge is the solid, semisolid or liquid residue generated during the treatment of domestic sewage. When sludge materials go through additional processing steps and treatment to meet EPA

EPA Unable to Assess the Impact of Hundreds of Unregulated Pollutants in Land-Applied Biosolids on Human Health and the Environment

What We Found

The EPA's controls over the land application of sewage sludge (biosolids) were incomplete or had weaknesses and may not fully protect human health and the environment. The EPA consistently monitored biosolids for nine regulated pollutants. However, it lacked the data or risk assessment tools needed to make a determination on the safety of 352 pollutants found in biosolids. The EPA identified these pollutants in a variety of studies from 1989 through 2015. Our analysis determined that the 352 pollutants include 61 designated as acutely hazardous, hazardous or priority pollutants in other programs.

The EPA identified 352 pollutants in biosolids but cannot yet consider these pollutants for further regulation due to either a lack of data or risk assessment tools. Pollutants found in biosolids can include pharmaceuticals, steroids and flame retardants.

* EPA Unable to Assess the Impact of Hundreds of Unregulated Pollutants in Land-Applied Biosolids on Human Health and the Environment, U.S. EPA Inspector General, https://www.epa.gov/office-inspector-general/report-epa-unable-assess-impact-hundreds-unregulated-pollutants-land, viewed 1-2-20

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A Potential Solution for Flagstaff: Burn Sludge As A Low Fraction Co-Fuel with Wood

- In a properly designed bioenergy facility, de-watered sewage sludge could be burned safely along with forest biomass products to recover useful heat and/or electric power
- Combustion offers the surest way to destroy all the hazardous organics that are in the sludge
- There's plenty of precedent for sludge combustion, e.g., the Snowflake Novo Power Plant was originally designed to burn up to 30% paper sludge

Thank you.

Questions?

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