



How Are Biosolids Used & Managed in the U. S.?

Results of the 2nd Comprehensive National Biosolids Survey
2018 Data

Ned Beecher, Lead Author, NBDP & NEBRA

Juliana Beecher, Lead Author, NBDP & NEBRA

Janine Burke-Wells, NEBRA • Maile Lono-Batura, WEF

Nora Goldstein, *BioCycle* • Greg Kester, CASA • Bill Toffey, MABA

*Note: all photos used
with permission.
Credits shown at
biosolidsdata.org.*

All Available Slides - FINAL • August 5, 2022

About these slides...

- These slides provide charts/graphs for the most significant nationwide totals related to biosolids use & disposal in the U. S. in 2018, which was the target data year for the NBDP. (2018 was chosen a representative year for biosolids management in the later 2010s & early 2020s.)
- In the following slides, for some data there are 2 or more charts presenting the same data in different ways; you can choose the version that works best for you, deleting the duplicate slide(s).
- Use of this spreadsheet and its data shall be in accordance with the NBDP Data Use Policy: <https://www.biosolidsdata.org/data-use-policy>
- There is a fee (\$) for licensed download and use of these slides. The fee supports the maintenance of the NBDP website. For details: <https://www.biosolidsdata.org/data-downloads>

Thanks to these partners for funding support!



NACWA





Thanks to these partners for funding support!

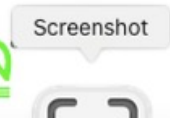


Screenshot

Thanks to these partners for funding support!



Metropolitan Water Reclamation District of Greater Chicago



Questions?



Janine Burke-Wells

[@nebiosolids.org](mailto:janine@nebiosolids.org)

603-323-7654



a National Biosolids Data Project presentation • June 24, 2022

A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.

Permission granted for use in accordance with [Data Use Policy](#).

The National Biosolids Data Project



- The original survey collected 2004 data, is outdated.
- This 2nd Survey collected 2018 data.
 - Lit. review & methods funded by USEPA Region 4
 - 2018 was before much impact of PFAS on biosolids management.
 - 2018 was representative of biosolids management in the decade of the 2010s.



- Comprehensive Biosolids Update
 - Regulation
 - Quality
 - End Use and Disposal Data



National Biosolids Data Project

- The goal of the National Biosolids Data Project is to compile and publish the most robust dataset on biosolids management in the U.S. and make the data available to benefit the biosolids and related professions.
- The first major national survey on biosolids regulation, quality, end use, and disposal was published in 2007, reporting data from 2004 (NEBRA et al., 2007). That report is also available at the NBDP website. Trends from 2004 – 2018 are included herein.
- Further information:
<https://www.biosolidsdata.org/about>



Harvesting corn fertilized with biosolids, Virginia





NBDP Survey Topics

- How much & where biosolids were used or disposed in 2018
- Quality: Class A, B; nutrient levels, meeting Part 503 Table 3
- Biosolids management details
- Energy – limited data, but useful insights
- Economic Data – limited data, but useful insights never compiled before
- Issues & pressures on biosolids management programs
- Trends
- Septage & other outside wastes (limited data, from some states only)

National Biosolids Data Project – 2 separate but similar surveys to collect data:



- State Biosolids Coordinators' Survey – 2018 Data
 - Spreadsheet
 - Online Survey
- WRRF Survey – 2018 Data
 - Online Survey

A screenshot of the "WWTP Biosolids Survey - 2018 Data" webpage. The page has a dark green header with the project logo and title. Below the header is a light green section titled "1. Welcome". The main content area is white with green text. It includes a welcome message, instructions for contractors, and specific instructions for users in New York or New England, Georgia, and Missouri/Mississippi River Flood 2018. At the bottom, there is a "Welcome to The National Biosolids Survey - 2018 Data" section with a brief description of the Core Survey.

WWTP Biosolids Survey - 2018 Data

1. Welcome

This survey is still open (Sept 2021)! Thanks for completing it!
Contractor manage your sludge? Send them this survey link & have them complete the Core Survey (6 pages) *for just your sludge*. BUT you can continue the survey now, skipping over the Core Survey (5 pages) - just enter a few required answers & your name & contact info when asked - and *go on & complete the rest of the survey*.

Are you in New York or New England (CT, MA, ME, NH, RI, VT)?
If you are with a WWTP in one of these states, please complete the parallel NEIWPCB Biosolids Survey - [click here](#). Both that survey and the one below are essentially the same, and the data from both will be combined for our national data set.

Georgia? There were GAWP, etc. surveys for 2018. We will use those compiled data. **But this survey asks additional questions, so please do it. Thank you!**

Missouri/Mississippi River Flood 2018? Please provide 2017 data if it is more representative of your WWTP's biosolids management and note this in the comments.

Has anyone else at your WWTP done this survey? Please check, to avoid duplicates. Click the green button here: <https://www.nbiosolids.org/nbi2definitions>

Welcome to The National Biosolids Survey - 2018 Data.
The **Core Survey** has about 25 questions; many are quick to answer. It should take about 30 minutes to complete (if you have your 2018 data ready). But please complete the additional sections.

Metadata & Quality of NBDP STATE-BY-STATE Survey Data



- Careful compilation of data for each state, DC, & larger territories
- Standard, consistent method & review process for each state report
- Corroboration using a) EPA ECHO data where available & b) calculated estimates based on wastewater flows and population
- Almost all state reports were reviewed by state biosolids coordinator or other state expert
- Confidence in states' data quality:
 - 32 "High" or "Moderately High"
 - 17 "Moderate"
 - 4 "Low"

a National Biosolids Data Project presentation • June 24, 2022

A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.

Permission granted for use in accordance with [Data Use Policy](#).

HOW WELL DO NBDP WRRF DATA REFLECT GEOGRAPHY/ POPULATION?

Over-represented in
NBDP responses

Under-represented

EPA Region	WRRF Survey Responses: number & percentage by Region		EPA Region Population
1 – New England	108	24%	4%
2 – NJ, NY, PR	32	7%	9%
3 – Mid-Atlantic	44	10%	9%
4 – Southeast	32	7%	20%
5 – Upper Midwest	60	13%	16%
6 – So. Central	11	2%	13%
7 – IA, KS, NE, MO	55	12%	4%
8 – Rocky Mtns.	26	6%	4%
9 – AZ, CA, HI, NV	48	11%	15%
10 – Northwest	36	8%	4%
TOTALS	452	100%	98%

HOW WELL DO NBDP DATA REPRESENT DIFFERENT SIZES OF U.S. WRRFS?

Over-represented in
NBDP responses

Under-represented

Flow Range (mgd)	Number of WRRFs*	% Avg. Daily Flow*	% Avg. Daily Flow ^Δ	NBDP WRRF Survey %
0.00 – 0.10	6,830	0.9%	0.08%	0.01%
0.101 – 1.00	6,431	7%	2%	0.4%
1.001 – 10.0	2,771	26%	13%	7%
10.001 - 100	503	39%	36%	34%
> 100.001	41	27%	49%	59%
Totals	2004:16,583* 2017: 15,008 ^Δ	33,657 mgd*	34,869 mgd ^Δ	100%

*Data from NEBRA et al., 2007, courtesy Robert K. Bastian, based on Clean Watershed Needs Survey; another 7 WRRFs labeled as "Other" are not included here

^Δ Data from Seiple et al., 2017 and Seiple et al., 2020

NBDP WRRF survey responses are...



- ...more from the largest WRRFs;
- ...more from New England especially, as well as from Missouri (plain states) & the Northwest; and
- ...less from smaller facilities (<10 mgd); and
- ...less from the southeast & south central states.

But, overall, good representation.

THANKS to all those who did the survey!

a National Biosolids Data Project presentation • June 24, 2022

A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.

Permission granted for use in accordance with [Data Use Policy](#).



*thermal
hydrolysis & AD
tour, Blue Plains,
Washington, DC*



Results



*biosolids
composting,
Topeka, KS*

*biosolids
demonstration
corn row, MI*



How much biosolids?

Total wastewater solids *used or disposed* in the U. S., 2018:

5,823,000 dry metric tons (dmt)

from state-by-state data compilation (5.823 million dmt)



Compare this to **6,132,000 dmt in 2004** (NEBRA et al., 2007, which does not include 382,000 dmt identified as "stored" in the 2004 data).

- **The 2018 total is 309,000 dmt lower due to:**

- The 2018 data were compiled with greater precision, assisted by increased consulting with state experts and use of EPA ECHO data for corroboration. There may have been more double-counting in 2004 data; this was avoided more in 2018. There were improvements in methods for estimating solids use & disposal for some states (e.g. MO). And, for 2018, NBDP did not extrapolate extra tonnage for small facilities with no data; it was assumed that most of those solids were stored and that capturing >75% of each state's flow accounted for nearly all solids used & disposed. For 2004, some states' data were rounded up.
- In 2018, there is more anaerobic digestion (which reduces tonnage) and less alkaline stabilization (which increases tonnage); for example DC Water produced and recycled 49,000 less dmt in 2018 than in 2004.

a National Biosolids Data Project presentation • June 24, 2022

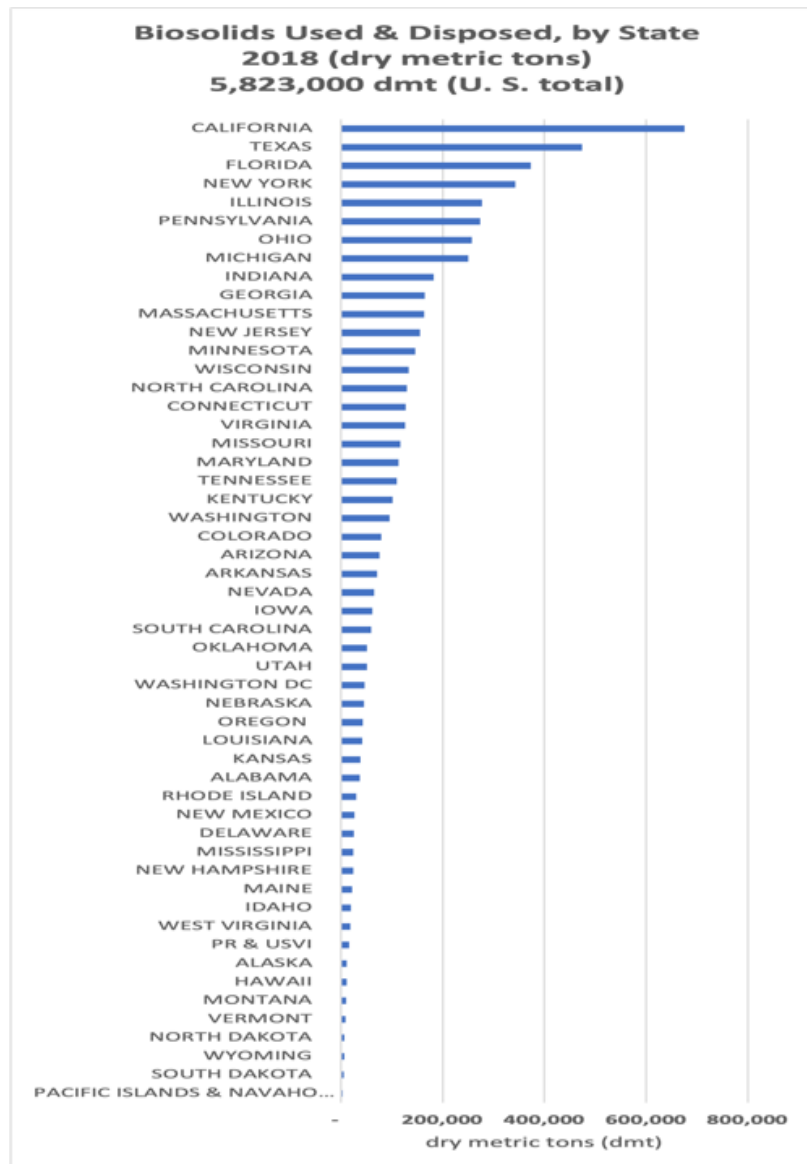
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.

Permission granted for use in accordance with [Data Use Policy](#).

State-by-state

biosolids use & disposal, 2018
(dry metric tons, dmt)

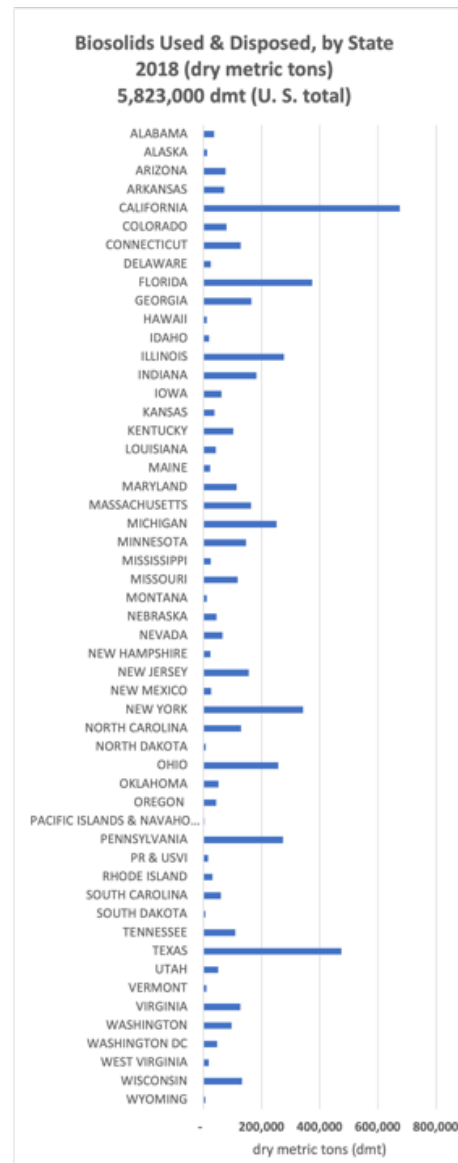
a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at
<https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).



State-by-state

biosolids use & disposal, 2018
(dry metric tons, dmt)

a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).

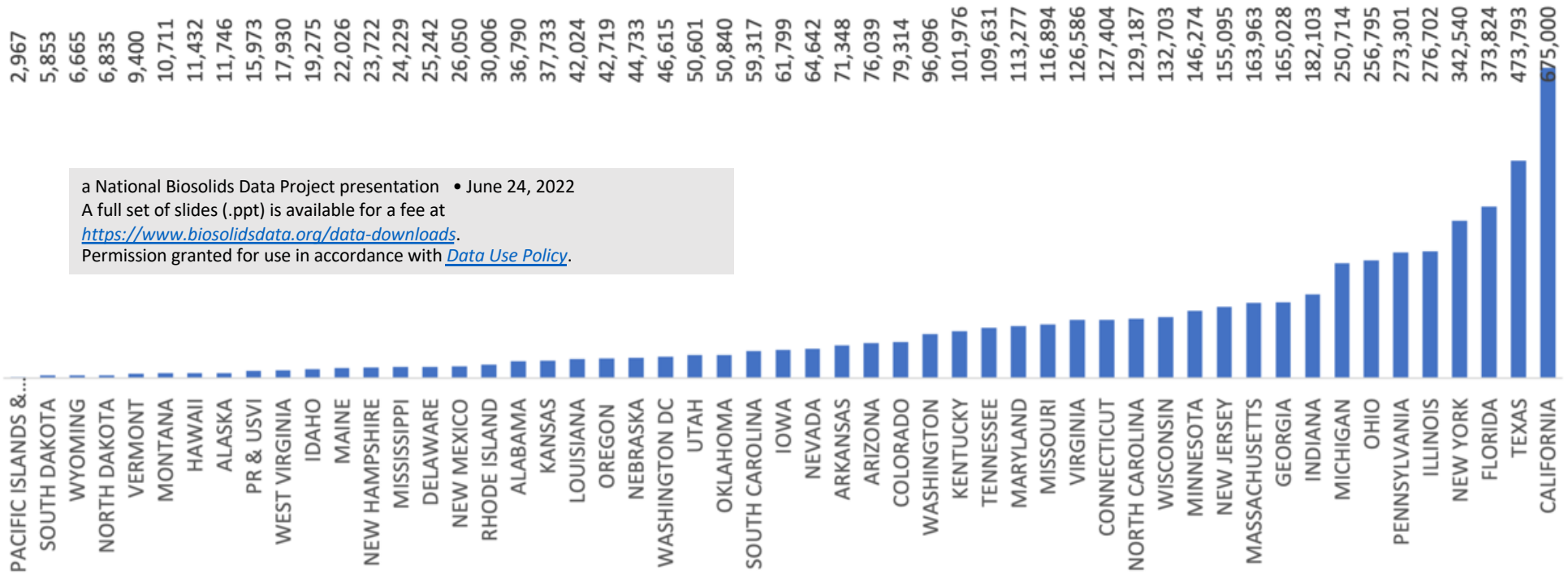


State-by-state biosolids use & disposal, 2018



Biosolids Used & Disposed, by State, 2018 (dry metric tons) 5,823,000 dmt (U. S. total)

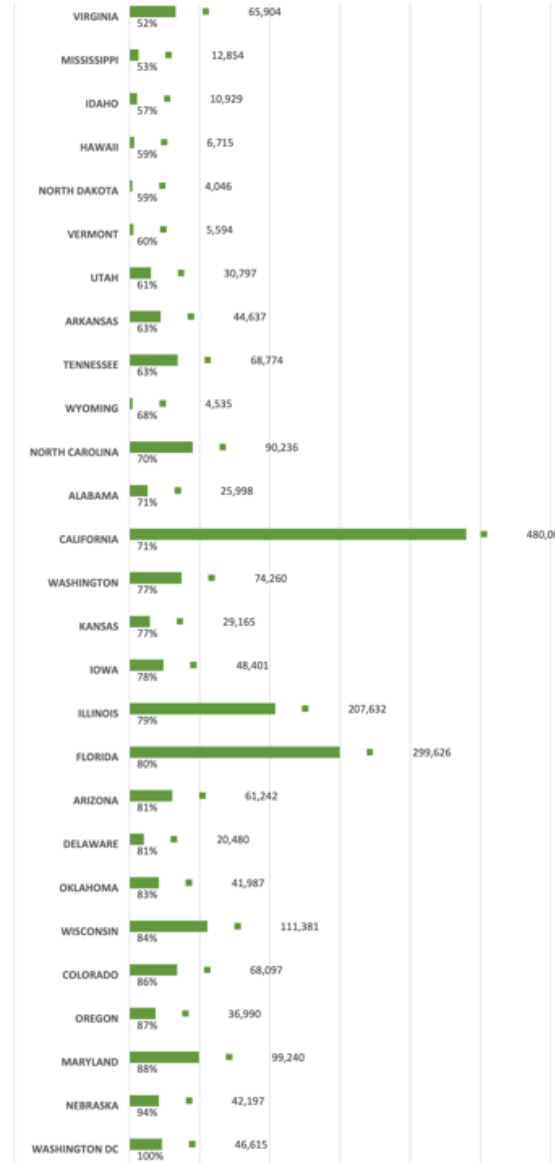
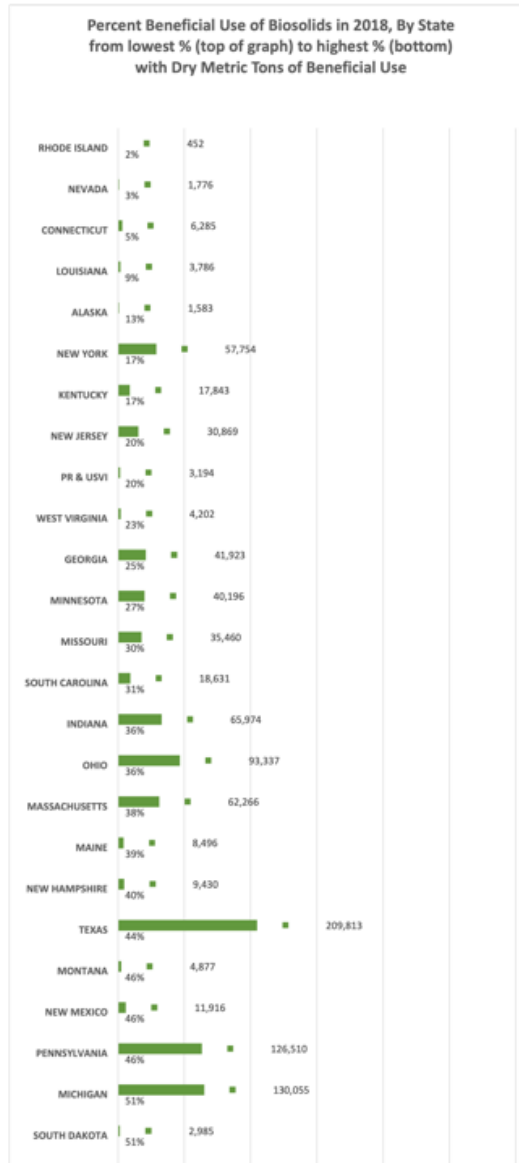
dry metric tons



a National Biosolids Data Project presentation • June 24, 2022
 A full set of slides (.ppt) is available for a fee at
<https://www.biosolidsdata.org/data-downloads>.
 Permission granted for use in accordance with [Data Use Policy](#).

State-by-state biosolids beneficial use, 2018 (percent (%)) and dry metric tons, dmt)

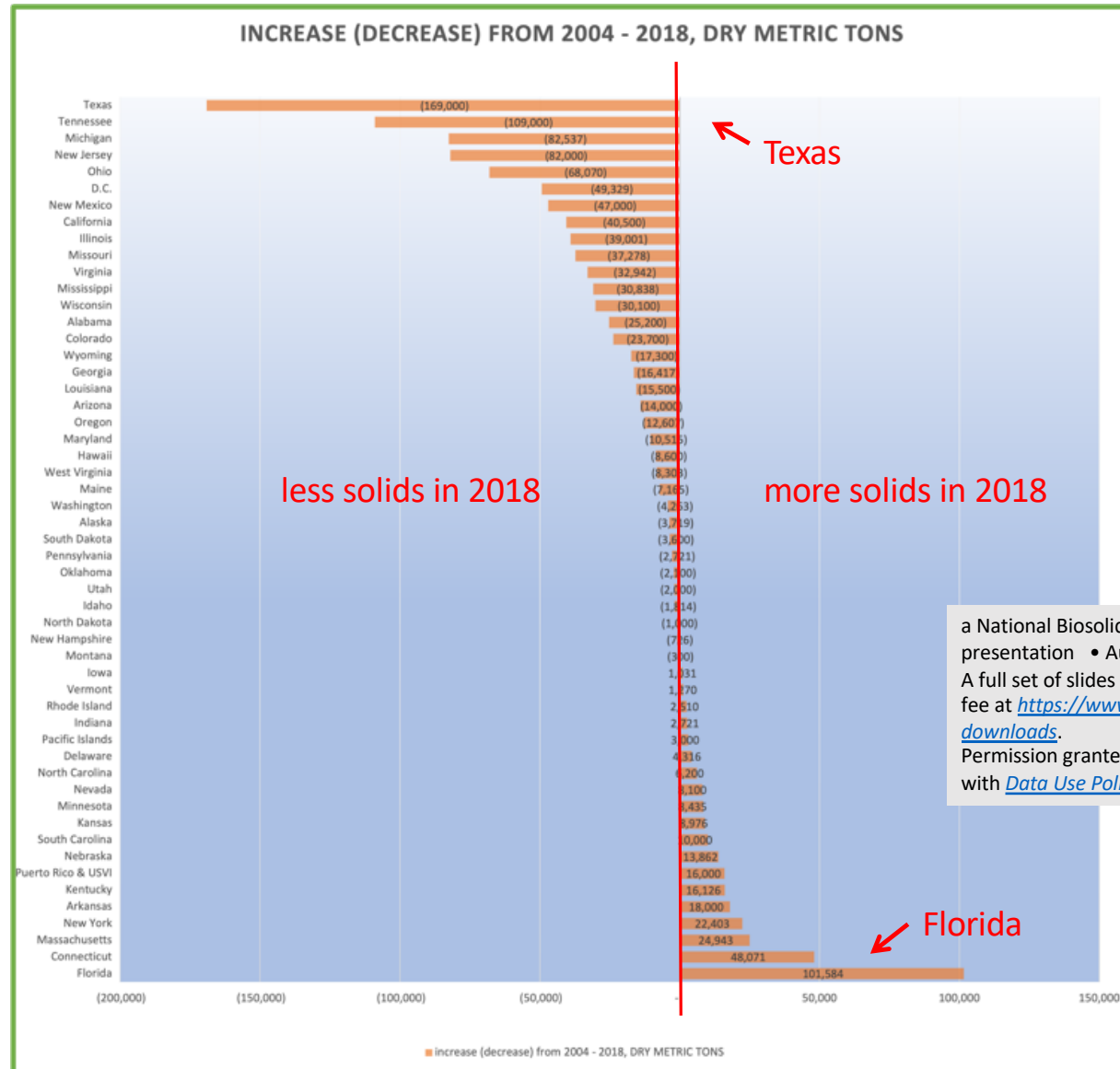
a National Biosolids Data Project
presentation • August 5, 2022
A full set of slides (.ppt) is available for a
fee at [https://www.biosolidsdata.org/data-
downloads](https://www.biosolidsdata.org/data-downloads).
Permission granted for use in accordance
with [Data Use Policy](#).



State-by-state

increase
(decrease) in
biosolids used
& disposed,
2004 – 2018

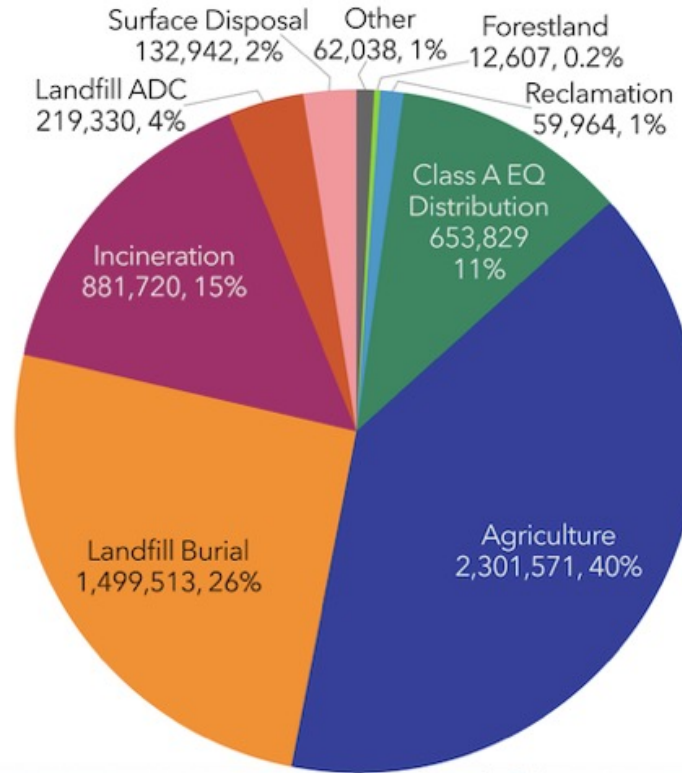
Differences
may be due to
data
compilation
changes as well
as biosolids
management
practices.



How much biosolids? Use & disposal

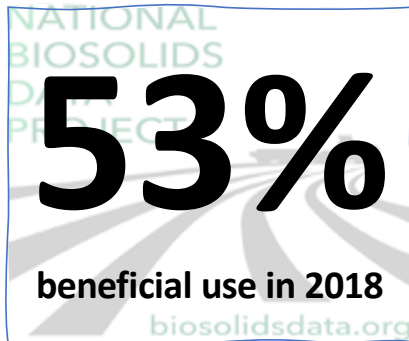
Biosolids Use & Disposal	%	dry metric tons
% Beneficial Use	53%	3,027,971
% Disposal	47%	2,733,505
% Agricultural	40%	2,301,571
% Forestland	0.2%	12,607
% Reclamation	1%	59,964
% Class A EQ Distribution	11%	653,829
% Landfill Burial	26%	1,499,513
% Landfill ADC	4%	219,330
% Surface Disposal	2%	132,942
% Incineration	15%	881,720
% Other	1%	62,038
Total (dry metric tons)		5,823,000

United States
Biosolids Use & Disposal 2018
(dry metric tons, %)
Total: 5,823,000



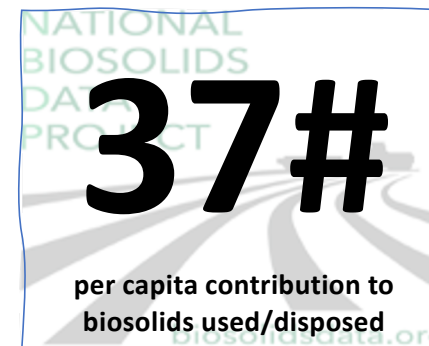
a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).

U. S. Biosolids Use & Disposal, 2018



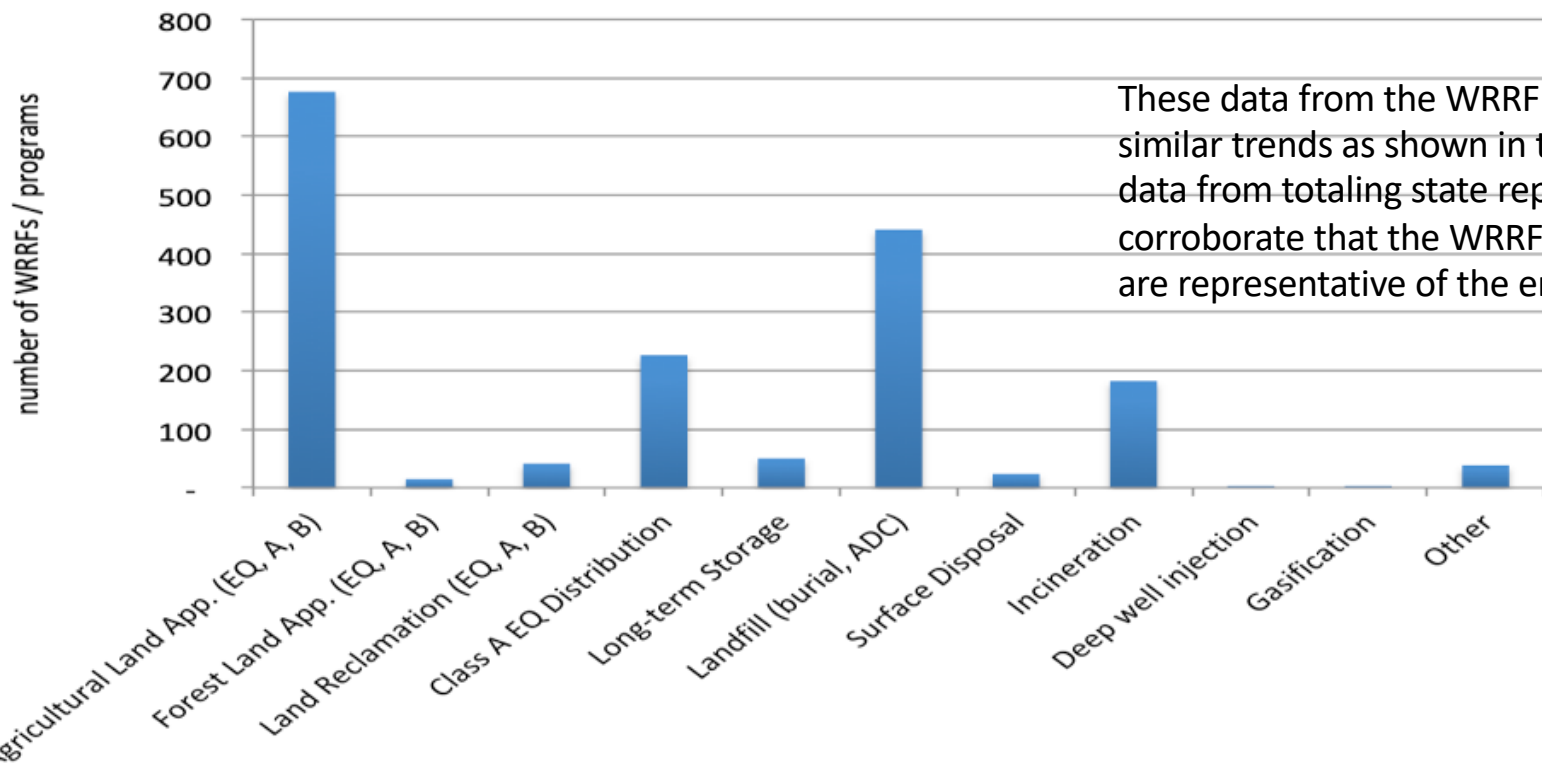
- 53% of biosolids were beneficially used in 2018

- ~37 pounds = the average per capita contribution to biosolids used or disposed in the U.S.



BIOSOLIDS END USE OR DISPOSAL

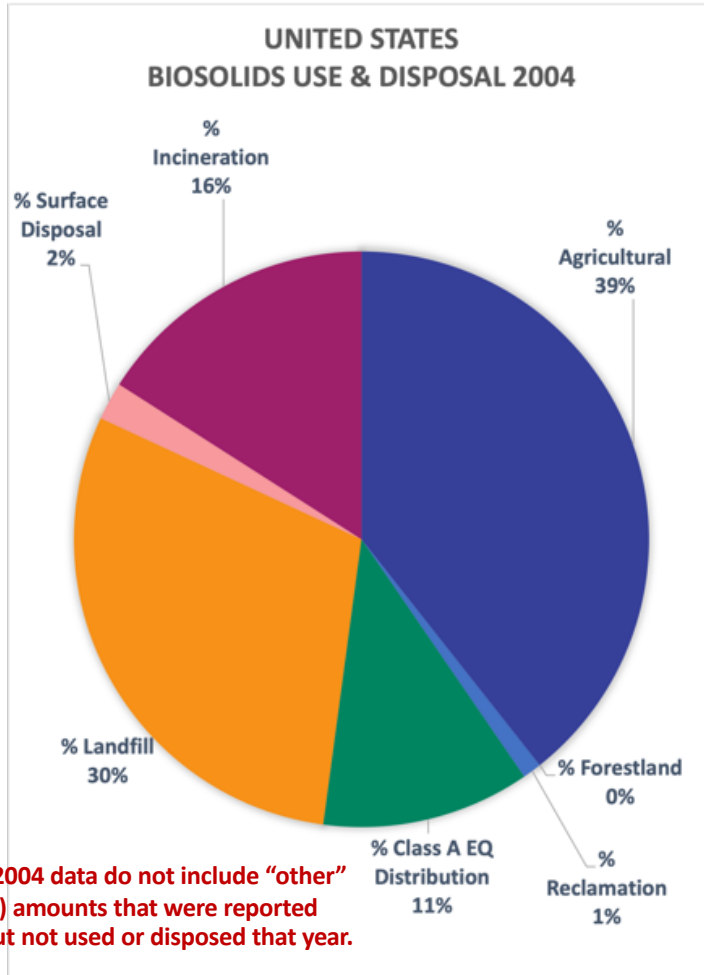
Relative numbers of WRRFs, in 2018, extrapolated from WRRF survey
(n = 452)



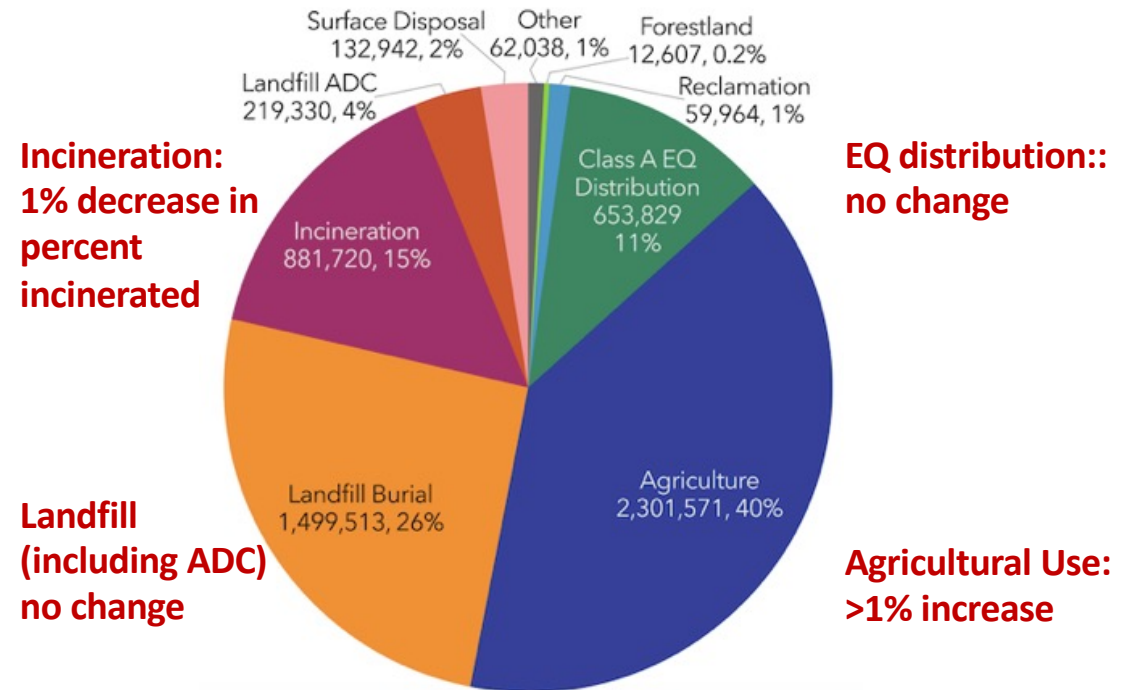
These data from the WRRF survey show similar trends as shown in the nationwide data from totaling state reports, helping corroborate that the WRRF survey data are representative of the entire U. S..

Comparing 2004 to 2018 Use & Disposal (%)

NATIONAL
BIOSOLIDS
DATA
PROJECT



United States
Biosolids Use & Disposal 2018
(dry metric tons, %)
Total: 5,823,000

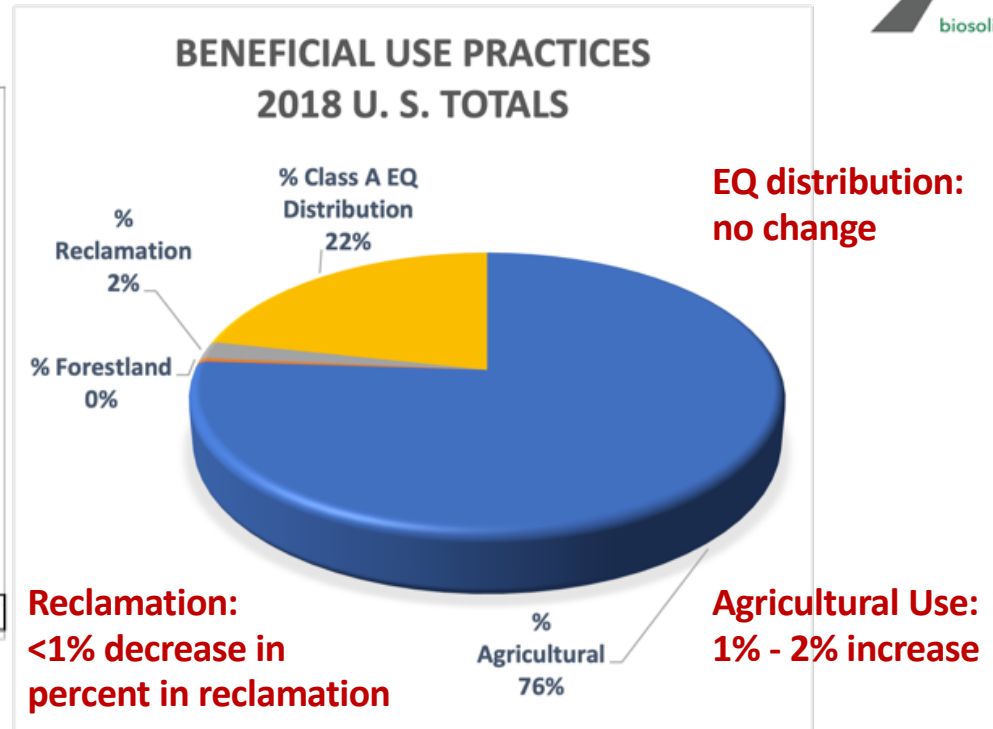
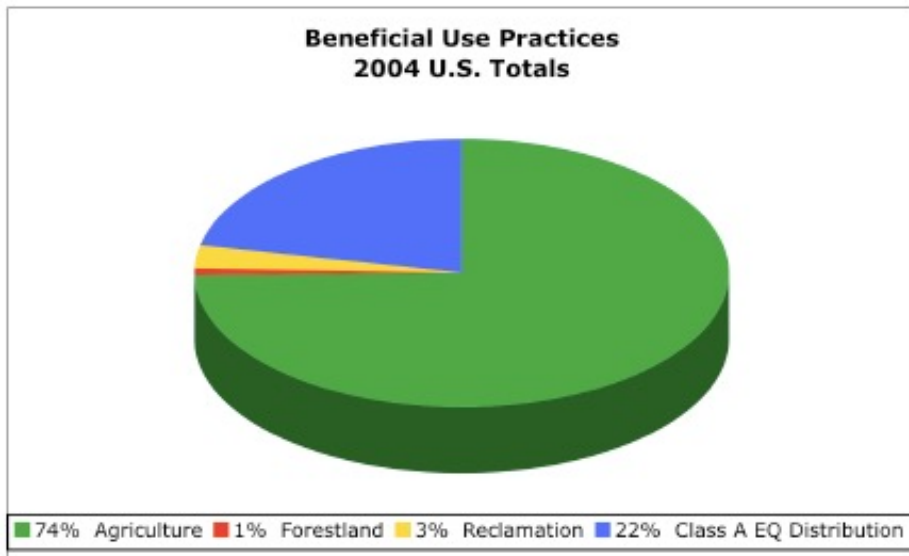


a National Biosolids Data Project presentation • June 24, 2022

A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.

Permission granted for use in accordance with [Data Use Policy](#).

Comparing 2004 to 2018 Uses: Small increase in percent (%) agricultural use

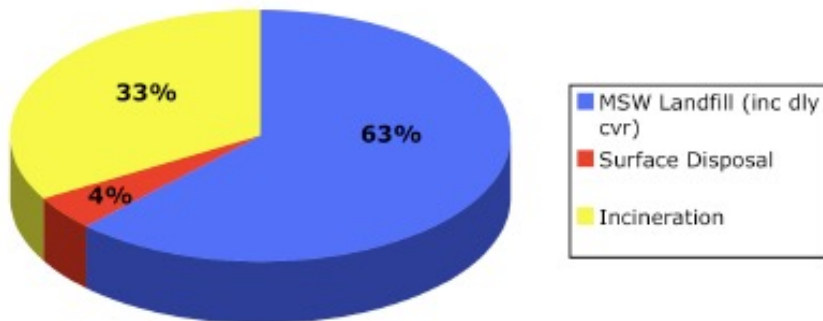


How much biosolids?

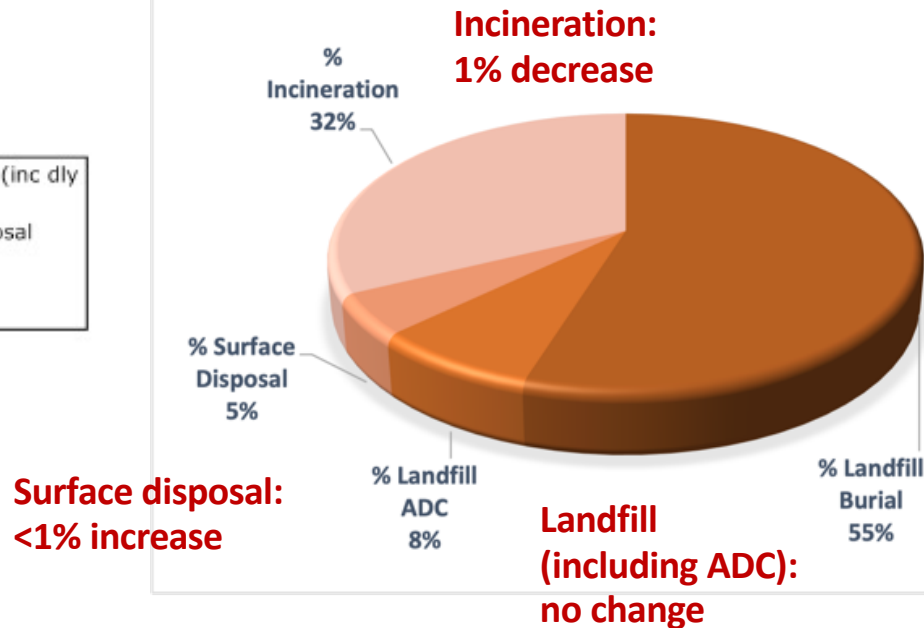
Comparing 2004 to 2018 Disposal: Small decrease in % incinerated



Disposal Practices
2004 U.S. Totals



DISPOSAL PRACTICES
2018 U. S. TOTALS



a National Biosolids Data Project presentation • June 24, 2022

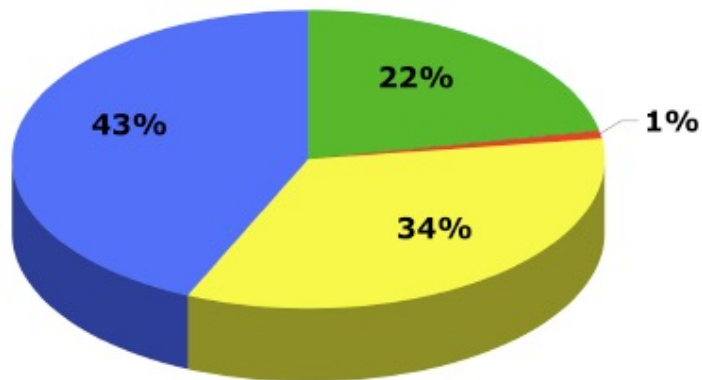
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.

Permission granted for use in accordance with [Data Use Policy](#).

Biosolids Treatment Level (Quality): 2004 vs. 2018: Decrease in % Class B... Increase in % Class A

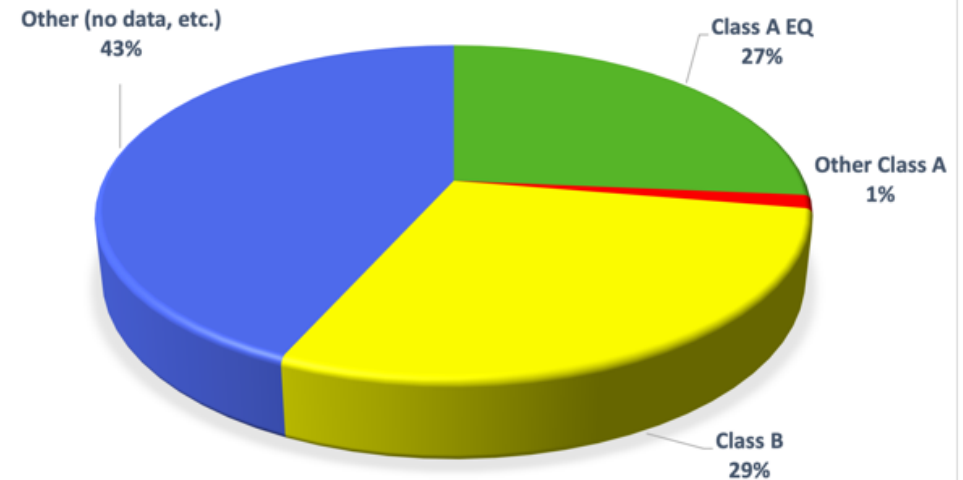


2004 U.S. Totals



■ Class A EQ
 ■ Class A
 ■ Class B
 ■ No Data on Quality

BIOSOLIDS TREATMENT LEVEL (QUALITY)
2018 U. S. TOTALS



**Class A & EQ:
5% increase**

**Class B:
5% decrease**

a National Biosolids Data Project presentation • June 24, 2022

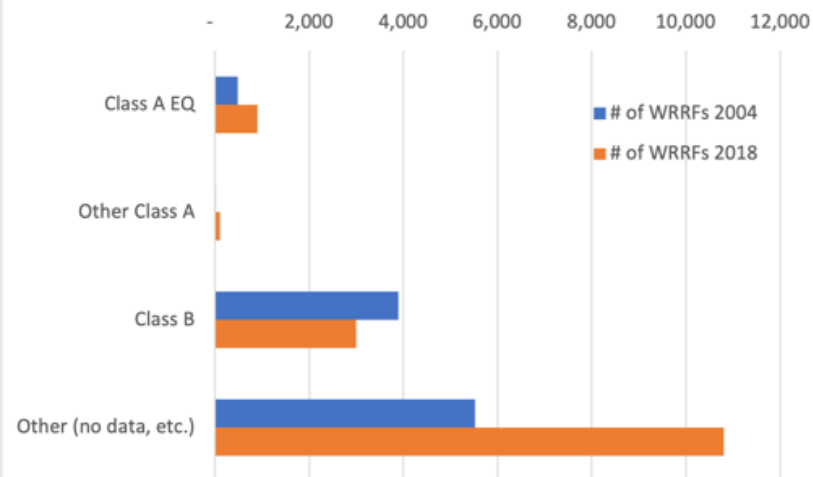
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.

Permission granted for use in accordance with [Data Use Policy](#).

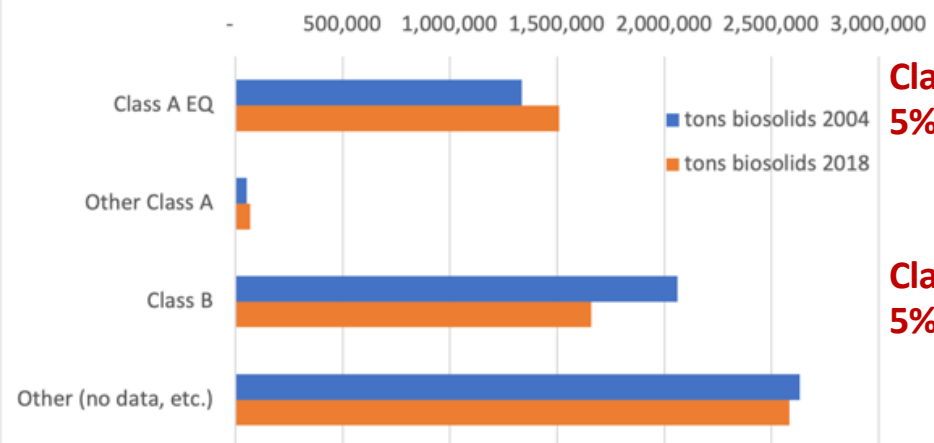
Biosolids Treatment Level (Quality): 2004 vs. 2018



Proportional Numbers of WRRFs Producing Biosolids of Each Class, 2004 vs. 2018



Tons Biosolids Used or Disposed, by Class, 2004 vs. 2018



**Class A & EQ:
5% increase**

**Class B:
5% decrease**

a National Biosolids Data Project presentation • June 24, 2022

A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.

Permission granted for use in accordance with [Data Use Policy](#).

Biosolids Quality (data from WRRF survey)

- In 2018, did all of your biosolids meet Part 503 Table 3 (high quality) standards? (n = 416)
 - 330 Yes
 - 13 No
 - 73 Don't know or Not applicable (often, there is no treatment when the solids are being sent to landfill or incineration)
- Average % solids of biosolids (n=80): 22%

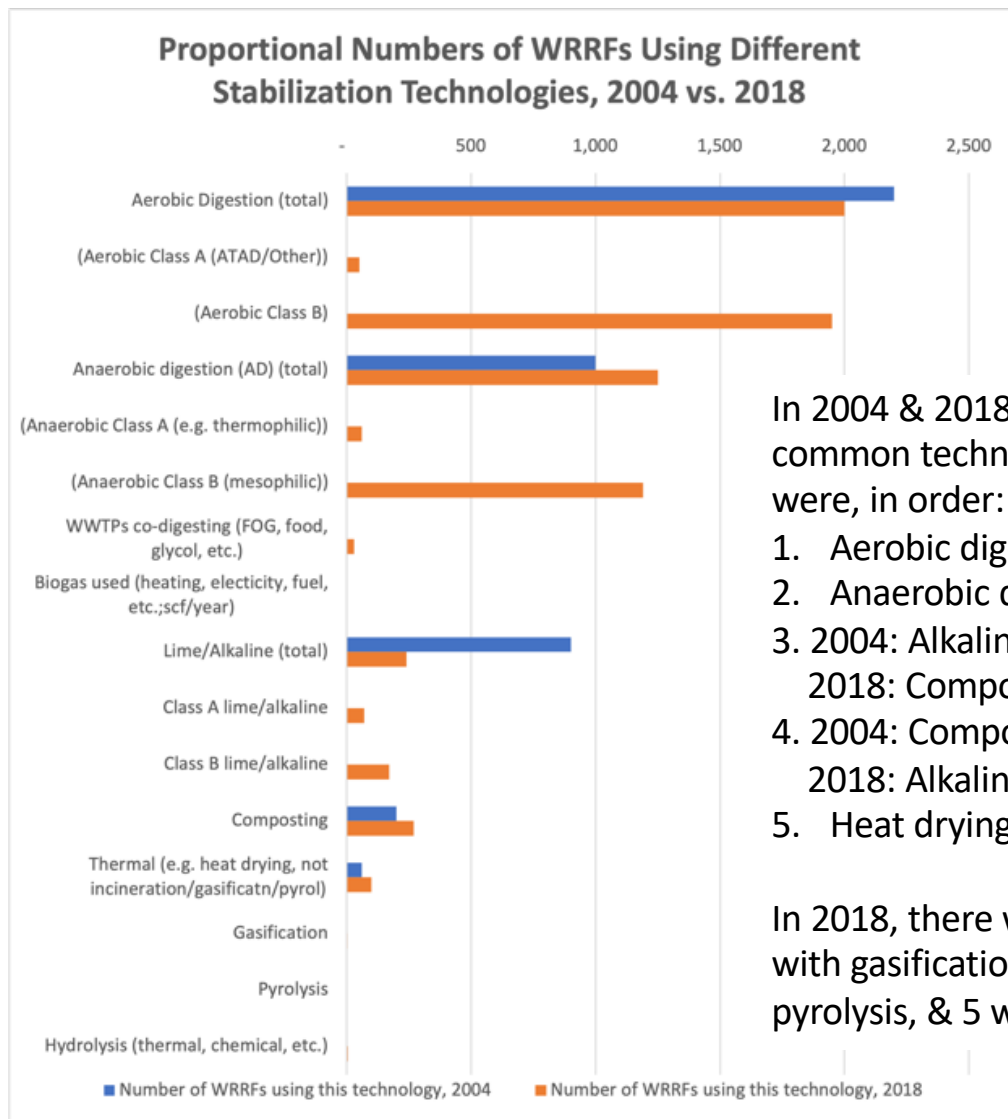


Treatment Technologies in Use in the U. S. –

Stabilization

Proportional numbers of WRRFs Using Different Stabilization Technologies, 2004 vs. 2018

a National Biosolids Data Project presentation • August 5, 2022
 A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
 Permission granted for use in accordance with [Data Use Policy](#).



In 2004 & 2018, the most common technologies used were, in order:

1. Aerobic digestion
2. Anaerobic digestion
3. 2004: Alkaline stabilization
2018: Composting
4. 2004: Composting
2018: Alkaline stabilization
5. Heat drying

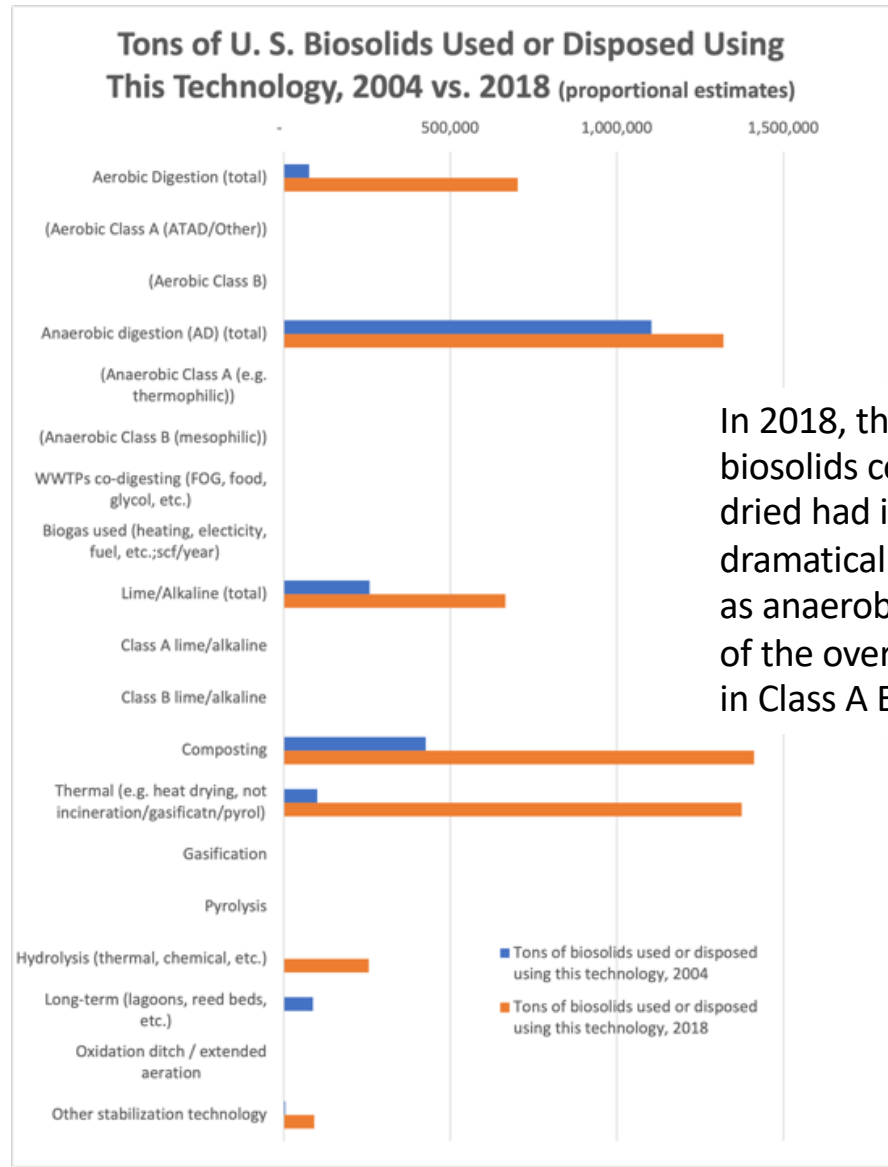
In 2018, there were 3 WRRFs with gasification, 0 with pyrolysis, & 5 with hydrolysis

Treatment Technologies in Use in the U. S.

Stabilization

Tons of Biosolids Used or Disposed Using This Technology, 2004 vs. 2018 (proportional estimates)

a National Biosolids Data Project presentation • August 5, 2022
 A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
 Permission granted for use in accordance with [Data Use Policy](#).

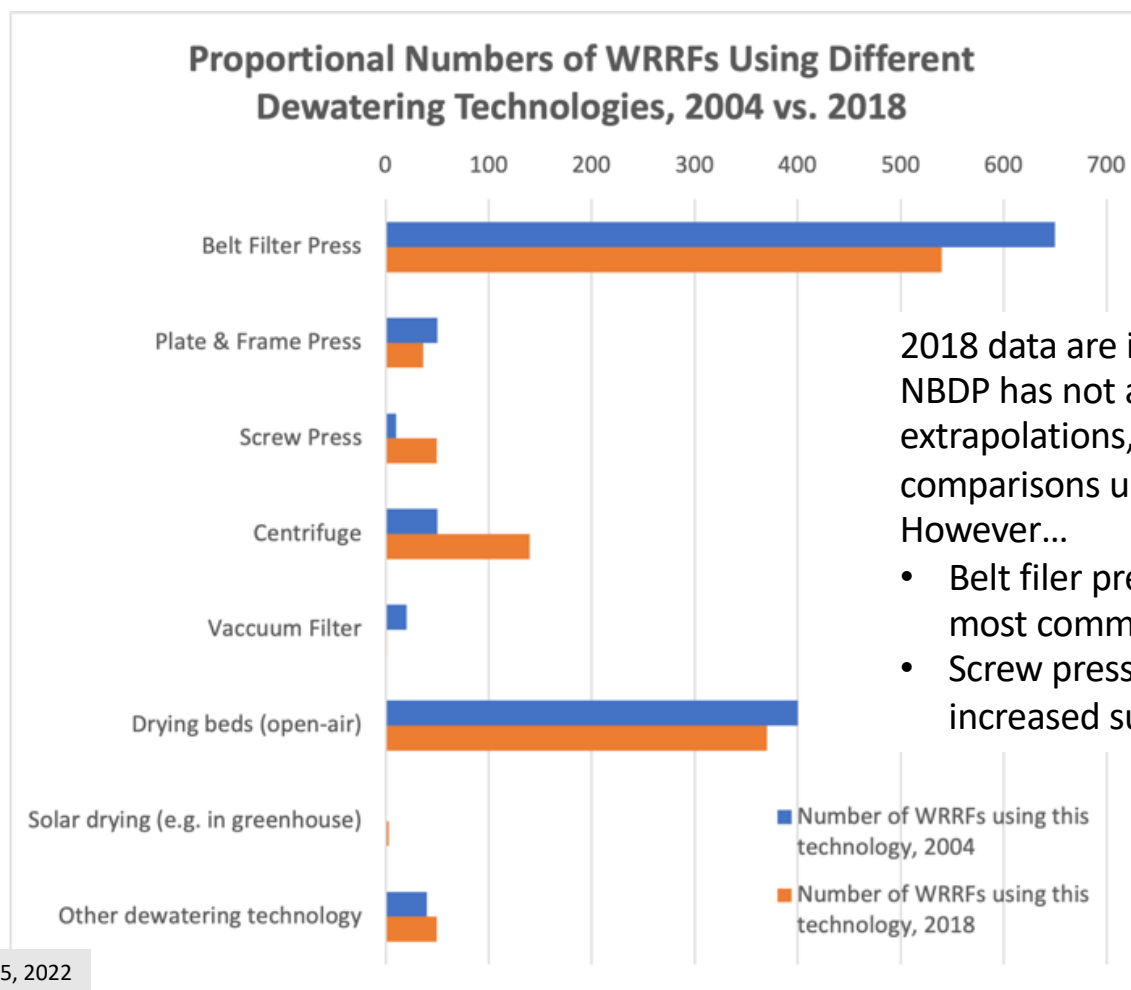


In 2018, the tonnages of biosolids composted or heat dried had increased dramatically to similar levels as anaerobic digestion – part of the overall ~5% increase in Class A EQ biosolids.

Treatment Technologies in Use in the U. S. –

Dewatering

Proportional numbers of WRRFs Using Different Dewatering Technologies, 2004 vs. 2018



2018 data are incomplete and NBDP has not attempted any extrapolations, making comparisons uncertain. However...

- Belt filter presses remain most common.
- Screw presses & centrifuges increased substantially.

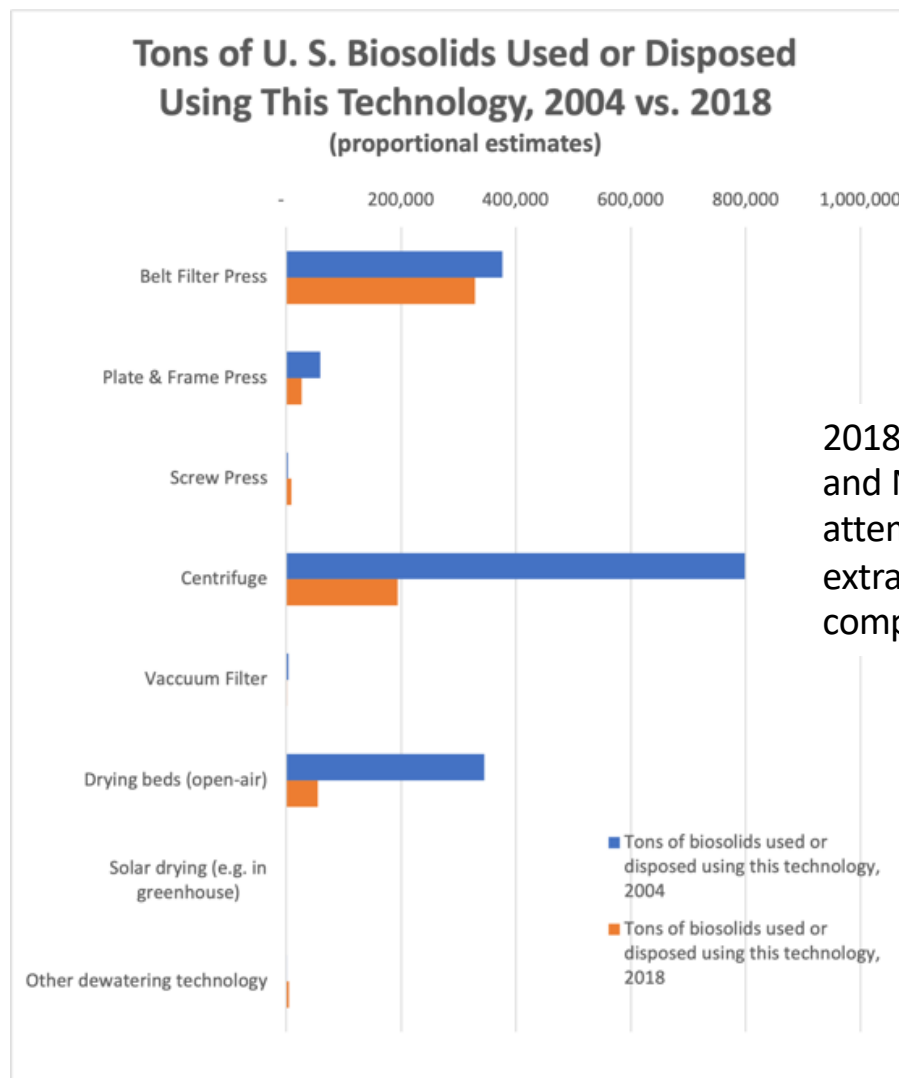
Treatment Technologies in Use in the U. S.

—

Dewatering

Tons of Biosolids Used or Disposed Using This Technology, 2004 vs. 2018 (proportional estimates)

a National Biosolids Data Project presentation • August 5, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).

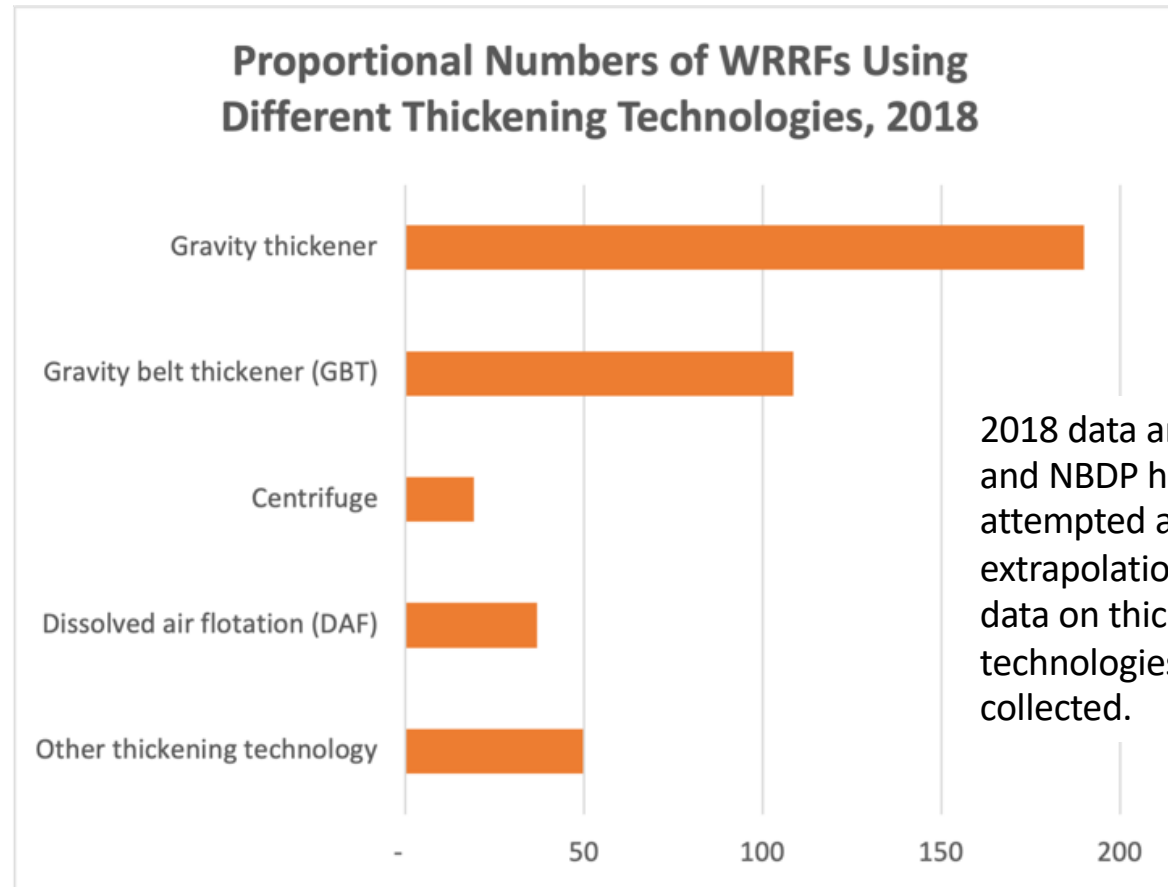


2018 data are incomplete and NBDP has not attempted any extrapolations, making comparisons uncertain.

Treatment Technologies in Use in the U. S. –

Thickening

Proportional numbers of WRRFs Using Different Thickening Technologies, 2018



2018 data are incomplete and NBDP has not attempted any extrapolations. In 2004, data on thickening technologies were not collected.

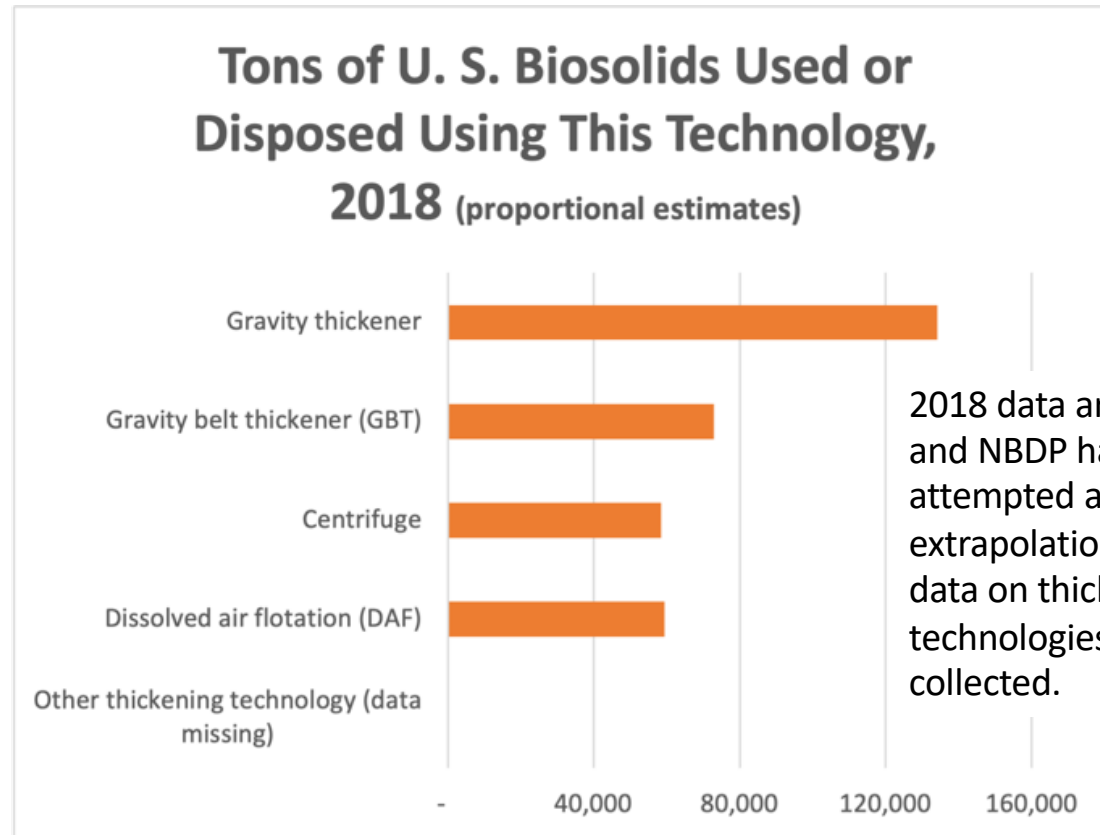
a National Biosolids Data Project presentation • August 5, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).

Treatment Technologies in Use in the U. S.

—

Thickening

Tons of Biosolids Used or Disposed Using This Technology, 2004 vs. 2018 (proportional estimates)



2018 data are incomplete and NBDP has not attempted any extrapolations. In 2004, data on thickening technologies were not collected.



Summary: Trends from 2004 to 2018

- More Class A & EQ biosolids being produced in 2018
- Same % of landfilled solids, despite more pressures & incentives to divert from landfills
- Less incineration (fewer SSIs & less tonnage)
- Decrease in state full-time employees (FTEs)
- In all years: Less than 1% of U.S. cropland would be needed for land application of all biosolids.

A local hardware store in western Maine enthusiastically advertises Milorganite every year.





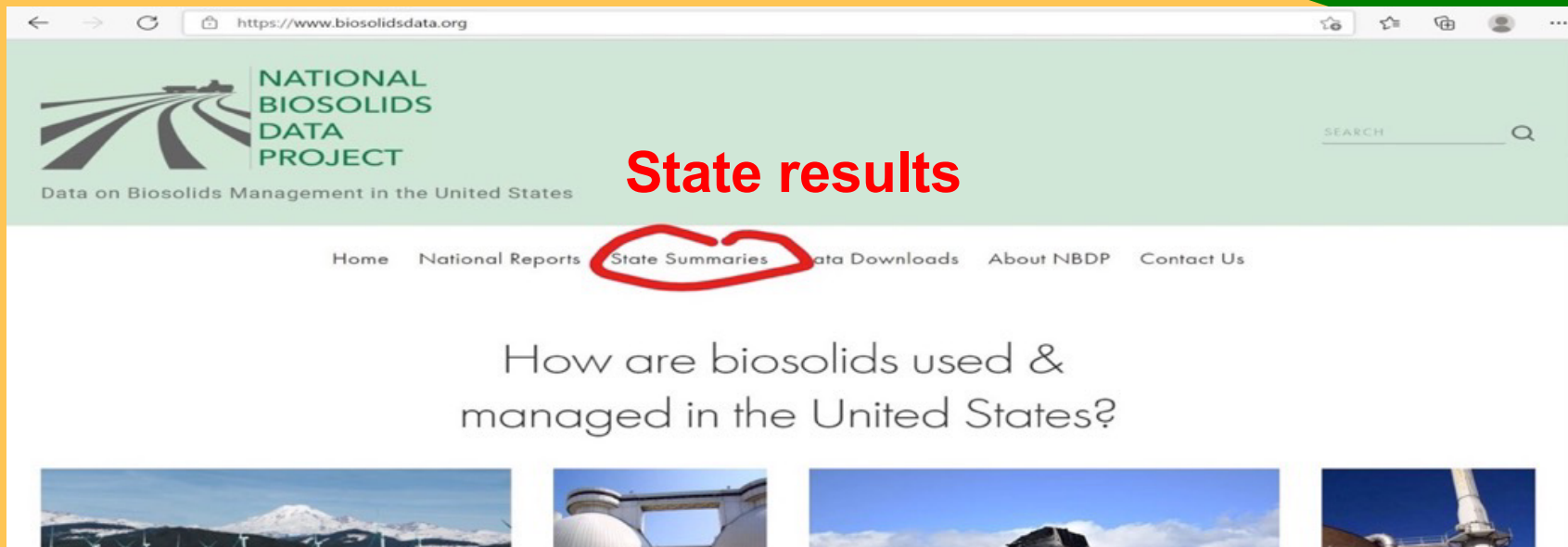
Navigating
<https://www.biosolidsdata.org>

*Liquid land
application by
injection,
Kentucky*



RESULTS

Results at www.biosolidsdata.org



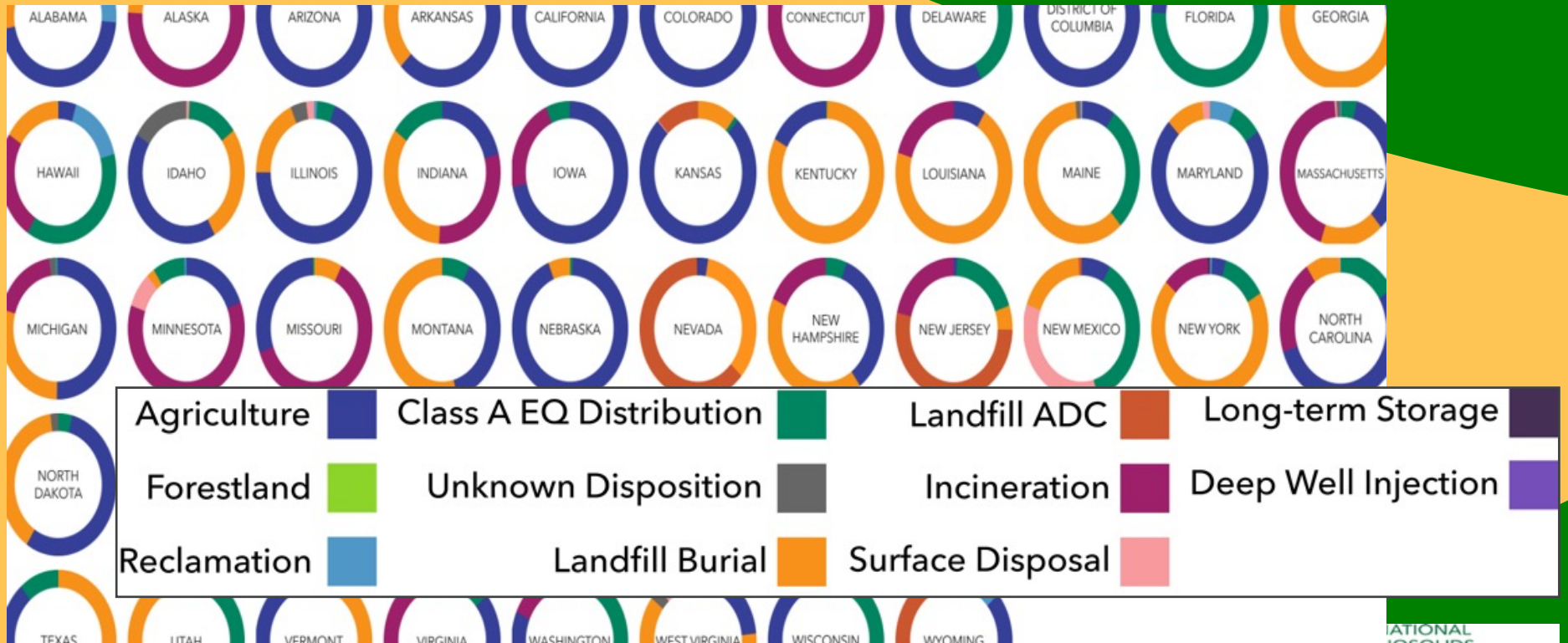
The screenshot shows the homepage of the National Biosolids Data Project website. The browser address bar displays <https://www.biosolidsdata.org>. The website header includes the logo for the National Biosolids Data Project, which features a stylized road leading to a city skyline, and the text "NATIONAL BIOSOLIDS DATA PROJECT" and "Data on Biosolids Management in the United States". A search bar is located in the top right corner. The main navigation menu includes "Home", "National Reports", "State Summaries" (circled in red), "Data Downloads", "About NBDP", and "Contact Us". Below the navigation menu, the main heading reads "How are biosolids used & managed in the United States?". At the bottom of the page, there are four small images: a landscape with snow-capped mountains, a large industrial tank, a close-up of a pipe, and a view of a facility with a tall chimney.

a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).



Navigating state data

Project Website: www.biosolidsdata.org – State Data



a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).



Navigating state data

Left column: state totals

Iowa Biosolids

Right column: state narrative summary

State Data

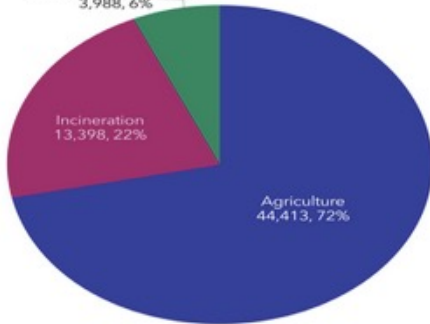
Confidence in data for this state:

HIGH

2018 data unless noted.

Iowa Biosolids Use & Disposal 2018 (dry metric tons, %) Total: 61,800

Class A EQ Distribution
3,988, 6%



Iowa Septage Management 2018 (% estimated) Total: 40,000,000 gallons



Middle column: dashboard of key state statistics

State Statistics Dashboard

Demographics & Wastewater

Avg population served per WRRF	3,118
Avg wastewater flow statewide (MGD)	607
WRRFs treating >75% WW flow	76
% of population served by on-site (septic) systems	26
Biosolids used or disposed / person in 2018 (lbs)	38

Biosolids Application

% of state area in cropland	76.88%
% cropland to which biosolids were applied	< 0.27%
application rate if all state biosolids were applied to cropland (dt/acre)	< 0.002
% cropland needed if all biosolids were applied at typical rate of ~3dt/acre	< 0.18%

State Summary

- Iowa has abundant agriculture, and biosolids recycling to soils is prevalent, routine, economical, and encouraged. Landfill disposal of sewage sludge is discouraged and landfill disposal Class A or Class B biosolids is prohibited.
- Nutrient management is a growing concern statewide; effluent standards and non-point nutrient sources are a focus – and biosolids might be.
- Des Moines – the state's largest WRRF – is a national leader in advanced anaerobic digestion and renewable natural gas (RNG) production, putting to use the abundant food processing and other liquid wastes available for co-digestion.
- IA DNR provides robust data on biosolids treatment technologies; see the state's data spreadsheet.

STATE NARRATIVE SUMMARY REPORT (PDF)



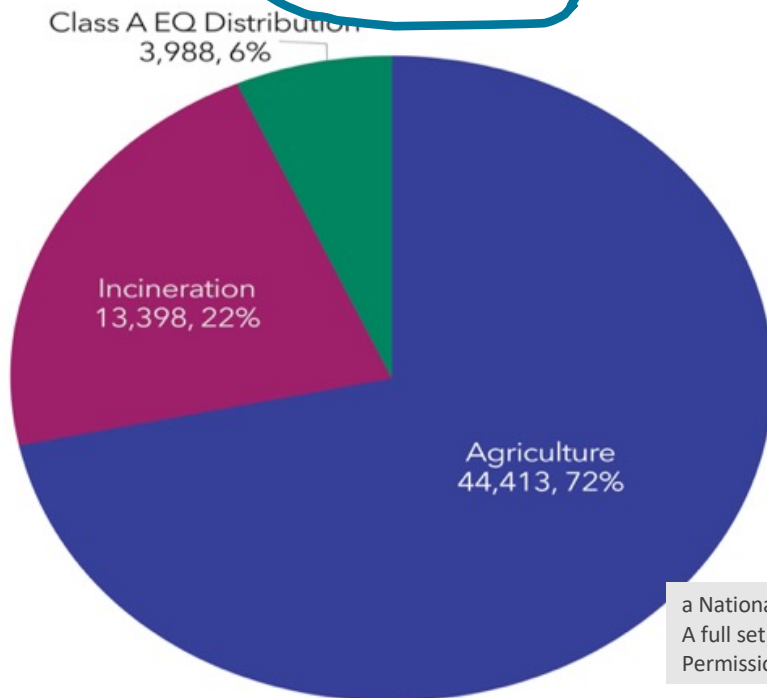
a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).



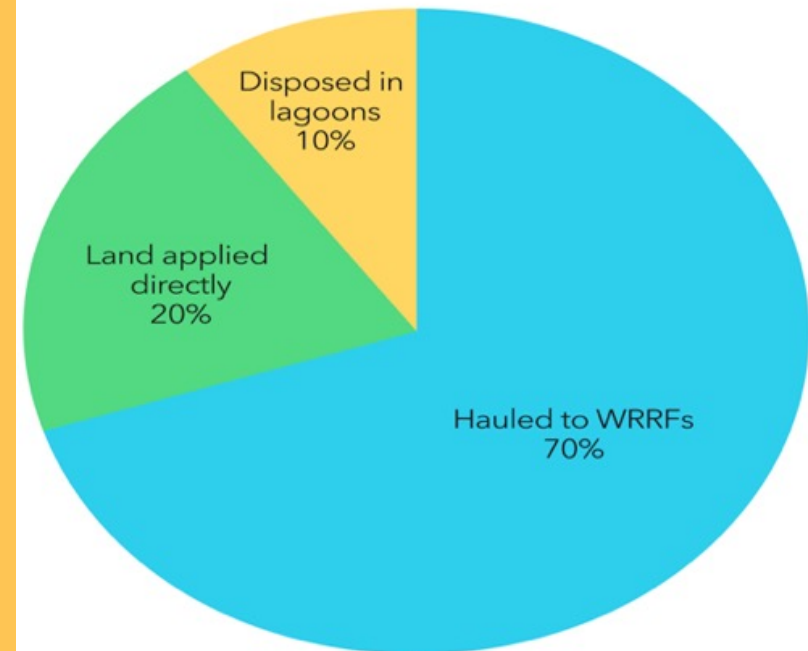
Navigating state data

Example: IOWA

Iowa Biosolids Use & Disposal 2018
(dry metric tons, %)
Total: 61,800



Iowa Septage Management 2018
(% estimated)
Total: 40,000,000 gallons



a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).



State Statistics Dashboard

Demographics & Wastewater

Avg population served per WRRF	2,718
Avg wastewater flow statewide (MGD)	507
WRRFs treating >75% WW flow	70
% of population served by on-site (septic) syste..	25
Biosolids used or disposed / person in 2018 (lbs)	39

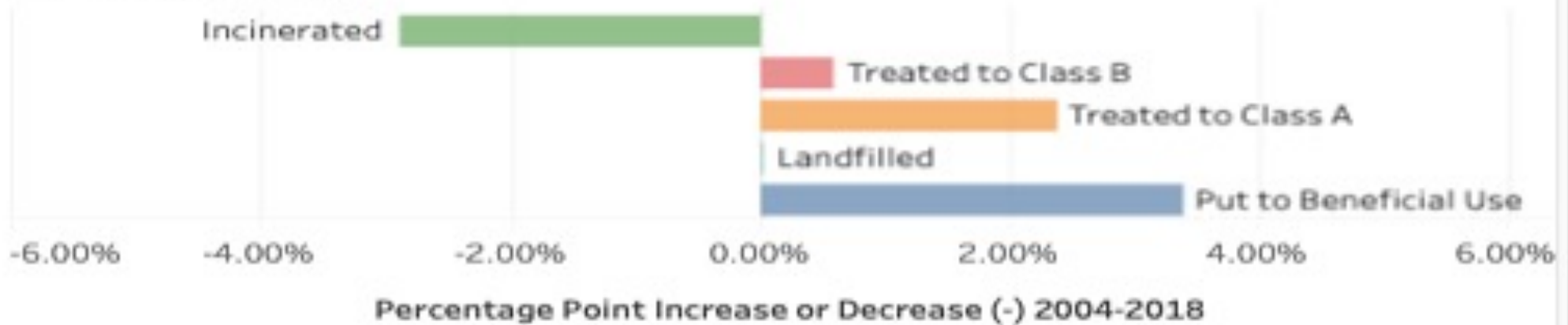
Biosolids Application

% of state area in cropland	74.000
% cropland to which biosolids were applied	0.070
application rate if all state biosolids were applied to cropland (dt/acre)	0.002
% cropland needed if all biosolids were applied at typical rate of ~3dt/acre	0.100
If all state's biosolids applied, what % of state's applied N would come from biosolids?	0.200
If all state's biosolids applied, what % of state's applied P would come from biosolids?	0.400

Changes in Biosolids Use & Disposal

Change* in solids reported used or disposed from 2004 to 2018: -5,201 dry metric tons

*change may be due to changes in population or solids treatment, and/or different systems of data tracking and reporting.



tableau



a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).



DASHBOARD

Iowa State Biosolids Statistics

Data Quality & Methods	2018	explanations & sources
<p>Quality & Confidence in this state's data:</p> <p>Data sources & methods:</p> <p>State biosolids included in 2018 EPA ECHO data</p>	<p>HIGH</p> <p><i>State biosolids coordinator, who was very thorough in completing this survey, tracks land application closely & compiles data from annual reports from WRRFs, which are now submitted electronically.</i></p> <p>103% % in ECHO vs. the total presented here</p>	<p>ranking by survey team based on information provided in survey (options: High, Moderate, Low, None)</p> <p>https://www.epa.gov/echo/echo-data-reports</p>
<p>Demographics & Wastewater</p> <p>State population:</p> <p>Total land area in state (acres):</p> <p>Population density (persons/square mile):</p> <p>Total number of WRRFs reported in state survey:</p> <p>total number of WRRFs permitted/reported elsewhere:</p> <p>number of WRRFs in EPA ECHO reports for 2018:</p> <p>Average population served per WRRF:</p> <p>Average wastewater flow statewide (MGD, NBDP):</p> <p>avg.wastewater flow statewide (MGD, Seiple):</p> <p>Number of WRRFs that treat >75% of state flow:</p> <p>% of population served by on-site (septic) systems:</p> <p>Biosolids used or disposed / person in 2018 (lbs):</p>	<p>3,156,145</p> <p>35,748,480</p> <p>56.5</p> <p>871</p> <p>763</p> <p>81</p> <p>2,718</p> <p>507</p> <p>371</p> <p>70</p> <p>25%</p> <p>39</p>	<p>U. S. Census estimate for July 1, 2018</p> <p>https://www.census.gov/prod/2018/states/iowa.html</p> <p>calculated</p> <p>survey response by state expert</p> <p>Seiple et al., 2020; state experts, etc.</p> <p>https://www.epa.gov/echo/echo-data-reports</p> <p>calculated</p> <p>survey response by state expert</p> <p>Seiple et al., 2020</p> <p>https://doi.org/10.1016/j.jenvman.2020.110852</p> <p>Seiple et al., 2020</p> <p>https://doi.org/10.1016/j.jenvman.2020.110853</p> <p>survey response by state expert</p> <p>calculated</p>
<p>Biosolids Application</p> <p>Agricultural land cropland (acres):</p> <p>% of state area in cropland:</p> <p>Number of farms with that cropland:</p> <p>% cropland to which biosolids were applied:</p> <p>Application rate if all state biosolids were applied to cropland (dry metric tons/ac.):</p> <p>% cropland needed if all state biosolids were applied at typical rate (~3 dt/ac):</p>	<p>26,545,960</p> <p>74%</p> <p>77,943</p> <p>0.07%</p> <p>0.2%</p> <p>0.1%</p>	<p>https://www.epa.gov/echo/echo-data-reports</p> <p>calculated</p> <p>https://www.epa.gov/echo/echo-data-reports</p> <p>calculated</p> <p>calculated</p> <p>calculated</p> <p>calculated</p>
<p>Nutrient Sources - Comparison</p> <p>Nitrogen (N) in all this state's biosolids (metric tonnes, 2018):</p> <p>N in this state's animal manures (metric tonnes):</p> <p>N in this state's purchased fertilizer (metric tonnes, 2011):</p> <p>If all state's biosolids applied, what % of state's applied N would come from biosolids?</p> <p>Phosphorus (P) in this state's biosolids (metric tonnes, 2018):</p> <p>P in this state's animal manures (metric tonnes):</p> <p>P in this state's purchased fertilizer (metric tonnes, 2011):</p>	<p>2,966</p> <p>398,551</p> <p>1,214,110</p> <p>0.2%</p> <p>1,236</p> <p>144,981</p> <p>200,085</p>	<p>calculated assuming avg. 4.8% biosolids N</p> <p>https://www.epa.gov/echo/echo-data-reports</p> <p>https://www.epa.gov/echo/echo-data-reports</p> <p>calculated</p> <p>calculated assuming avg. 2% biosolids P</p> <p>https://www.epa.gov/echo/echo-data-reports</p> <p>https://www.epa.gov/echo/echo-data-reports</p> <p>calculated</p>

<p>If all state's biosolids applied, what % of state's applied P would come from biosolids?</p>	<p>0.4%</p>	<p>calculated</p>
<p>State Regulatory Involvement Biosolids oversight agency / division: Permitting.... of biosolids programs: ...of land application sites: FTEs: state biosolids regulatory program: Biosolids program FTEs per million population: Enforcement: Inspections of biosolids facilities & field sites in 2018: Formal violations issued: Amount of state regulations beyond Part 503: Amount of state regulation of nutrient management & phosphorus: Accessibility of biosolids data to public: State encouragement of biosolids recycling to soils: Voluntary additional protections by land appliers known & reported by state coordinator:</p>	<p>Environment agency - water / wastewater program</p> <p>0.3 0.10 Iowa sewage sludge land application regulation IAC 567-67 is currently being revised. The draft revision is complete. Public hearing has been done. It is in the rulemaking process. The anticipation rule change will possibly be in 2021.</p> <p>20 0</p> <p>Low None (Part 503 requirements only) Moderate High None</p>	<p>survey response by state expert calculated survey response by state expert survey response by state expert rankings by survey team based on information provided in survey (options: High, Moderate, Low, None)</p>
<p>Trends New land application activity, 2018 - new permits & acreage, acres applied: acres applied in 2018: Local regulations & their impacts?: details... Legislative & state regulatory actions in 2018 & their impacts?: details... Biosolids beneficial use increasing... ..in 2018?: in 2020?: details...</p>	<p>No data</p> <p>18,889</p> <p>None</p> <p>Some</p> <p>It's staying the same. It's staying the same.</p>	<p>rankings by survey team based on information provided in survey (options: High, Moderate, Low, None)... With quotes of survey responses by state expert(s)</p> <p>0 0 0</p> <p>survey response by state expert survey response by state expert</p>
<p>Changes in Biosolids Use & Disposal Change* in solids reported used or disposed (in units used by state): Beneficial Use - percentage point increase or decrease (-): Landfill & surface disposal - % point increase or decrease (-): Incineration - percentage point increase or decrease (-): Class A - percentage point increase or decrease (-): Class B - percentage point increase or decrease (-): No class or not known - percentage point increase or decrease (-):</p>	<p>(5,201)</p> <p>3%</p> <p>0%</p> <p>-3%</p> <p>2%</p> <p>1%</p> <p>-3%</p>	<p>*Change may be due to population increase/decrease, change in treatment at a large WWTP, and/or different systems of data tracking and reporting.</p> <p>calculated comparing these 2018 data to 2004 data compiled by the same survey team (NEBRA, 2007)</p>
<p>Pressures on biosolids, 2018 1 PUBLIC INVOLVEMENT- concerns of neighbors, environmental groups, and others 2 MANAGEMENT ISSUES - the hassle of biosolids recycling/land application 3 COST - disposal options are least expensive 4 AGRICULTURAL ISSUES - declining farmland due to less agriculture or due to development, sprawl, seasonal restrictions, or competition with manures, etc. 5 REGULATIONS ON BENEFICIAL USE- strict EPA and/or state regulation and enforcement</p>		<p>survey response by state expert</p>



STATE BIOSOLIDS SURVEY

Iowa

Infrastructure & Wastewater

	2004 Data	2018 Data	
Total Number of WWTPs:	78 (survey), 730 CWNs	871	
WWTP & Biosolids Infrastructure Totals			
Number of Separate Preparers (in- or out-of-state, receiving solids from your state):	no data	1	-----
Total number of your state's WWTPs sending to those Separate Preparers:	0	1	-----
Number of operating sludge incinerators in your state (total):	2	1	-----
Fluidized bed:	1	0	-----
Multiple hearth:	1	1	-----
Number of Part 258 landfills in your state accepting sewage sludge:	data not requested for 2004	0	-----
Number of WWTPs in your state with industrial pre-treatment programs:	data not requested for 2004	20	-----
Number of WWTPs in your state with sludge lagoons:	data not requested for 2004		-----
Wastewater Flow Totals			
Total statewide average daily wastewater flow (MGD):	data not requested for 2004	507	-----
Total statewide WWTP design capacity for wastewater flow (MGD):	data not requested for 2004	857	-----
Total statewide average daily dry weather flow (MGD):	data not requested for 2004	348	-----
Other Totals			
Number of documented odor & nuisance complaints received by state in 2018 related to biosolids transportation and use or disposal outside of the gates of the WWTP:	data not requested for 2004	0	-----
Number of WWTPs involved in those complaints:	data not requested for 2004	0	-----
Percent of population served by on-site systems (e.g. septic systems):	no data	25%	-----

The 871 WWTPs are all municipal WWTPs. • Des Moines City is the 1 separate prepper, composting Des Moines biosolids. • Iowa has 871 municipal WWTPs that have NPDES discharge permits. Our major POTWs are 107 facilities (in 2020) based on the design average wet weather flow equal to or greater than 1 MGD. The design AWW flow for the 107 facilities ranges from 1 mgd to 134 mgd. • Major POTW facilities have biosolids annual reporting requirements to EPA and state. Minor facilities keep their biosolids report at their site. • Design flow definitions are in the Iowa Wastewater Facilities Design Standards Chapter 14. • The average dry weather flow in this survey is based on the average of the facility's design average dry weather flow, which is 3,248 MGD. The average statewide wastewater design capacity is based on the average of the facility's design average wet weather flow, the same number that designates a "major" facility, and is 6,256 mgd. The statewide average daily wastewater flow is the average of the ADW and AWW, in design. We did not run the LWR flow data for the actual average daily wastewater flow. All the flow numbers reported here are based on the wastewater treatment plant design flow in the construction permits that are approved by Iowa DNR. • Two dozen or more wastewater facilities are lagoon facilities that do not discharge every year. The survey data reported here are based on those POTWs that sent annual reports for biosolids land application.

Biosolids Use and Disposal

UNITS:	Dry U.S. tons	Dry metric tons	
BIOSOLIDS USED OR DISPOSED, 2018 (adjusted total):	61,800		
Summary			
	Number of Entities (WWTPs & Sep. Preparers) Going To...	Quantity of Biosolids	Number of Entities (WWTPs & Sep. Preparers) Going To... Quantity of Biosolids
Beneficial Use (applied to soils, not including ADC)	78	50,200	81 44,413
Disposal & Alternative Dispositions	2	16,600	1 13,398
Other	0	0	0 0
TOTAL	78	66,800	82 61,799
Beneficial Use			
	Number of Entities (WWTPs & Sep. Preparers) Going To...	Quantity of Biosolids	Number of Entities (WWTPs & Sep. Preparers) Going To... Quantity of Biosolids
Agricultural (EQ, Class A, & Class B)	85	48,200	85 44,413
Forestryland (EQ, Class A, & Class B)	0	0	0 0
Reclamation (EQ, Class A, & Class B)	0	0	0 0
Class A EQ Distribution (bagged or bulk, public distribution, or unsure where it went)	11	2,000	1 3,988
Beneficial Use Subtotal	78	50,200	81 44,401
Long-term storage	0	0	0 0
Number of acres to which biosolids were applied:		data not provided	18,689
Disposal & Alternative Dispositions			
	Number of Entities (WWTPs & Sep. Preparers) Going To...	Quantity of Biosolids	Number of Entities (WWTPs & Sep. Preparers) Going To... Quantity of Biosolids
Landfill (total)	0	0	1 3,065

NOTE: Quantity of sewage sludge or biosolids used or disposed means the quantity that goes out the gate of the WWTPs. Use the units (the form of measurement) you chose above.

The beneficial use numbers include some composted biosolids. The disposal numbers include incinerated biosolids. There is no Iowa wastewater sludge going to landfill. State law prohibits Class A and Class B biosolids going to landfill. Solid Waste Rule 121 on land application of waste, discourages sewage sludge going to landfill.

The Class A EQ material is composted biosolids sold to the market. This program is a separate prepper in Des Moines, IA: the city's Composting Facility.

Burial	data not requested for 2004	data not requested for 2004	0	0
Alternative daily (ADC), intermediate, or final cover	data not requested for 2004	data not requested for 2004	1	3,055
Surface Disposal	0	0	0	0
Incineration	2	16,460	1	13,398
Cement kiln or industrial furnace	data not requested for 2004	data not requested for 2004	0	0
Deep well injection	data not requested for 2004	data not requested for 2004	0	0
Gasification	data not requested for 2004	data not requested for 2004	0	0
Pyrolysis	data not requested for 2004	data not requested for 2004	0	0
Disposal & Alternative Dispositions Subtotal	2	16,460	1	13,398
TOTAL	78	66,660	82	61,799

The material included as ADC (row 10) is the ash from Cedar Rapids' incinerator that went to landfill ADC. The mass of this landfilled ash is not included in the disposal total, so as not to be double-counted.

Biosolids Quality Summary

	Number of Entities (WWTPs & Sep. Preparers) Producing...	Quantity of Biosolids	Number of Entities (WWTPs & Sep. Preparers) Producing...	Quantity of Biosolids
Class A EQ	11	5,200	2	6,374
Other Class A	0	0	0	0
Class B	65	46,000	79	42,027
Other (no data, etc.)	0	16,460	1	13,398
TOTAL	76	66,660	82	61,799

NOTE: For "number of entities," the total may not match because some entities go to more than one use or disposal.

The two facilities producing EQ biosolids are Des Moines' composting facility and Iowa City's WWTP.

Biosolids Treatment Practices

	Estimated Number of WWTPs or Separate Preparers Using...	Estimated Quantity of Biosolids Produced Using...	Estimated Number of WWTPs or Separate Preparers Using...	Estimated Quantity of Biosolids Produced Using...
Stabilization				
Aerobic Digestion (total)	25	no data	35	8,705
Class A (ATAD/Other)	data not requested for 2004	data not requested for 2004	0	0
Class B	data not requested for 2004	data not requested for 2004	35	8,705
Anaerobic digestion (AD) (total)	44	no data	66	33,435
Class A (e.g. thermophilic)	data not requested for 2004	data not requested for 2004	3	2,406
Class B (mesophilic)	data not requested for 2004	data not requested for 2004	45	31,029
WWTPs co-digesting (FOG, food, glycol, etc.)	data not requested for 2004	data not requested for 2004	at least Des Moines	N/A
Biogas used (heating, electricity, fuel, etc. per/yr)	data not requested for 2004	data not requested for 2004	13	N/A
Lime/Alkaline (total)	8	no data	3	880
Class A lime/alkaline	data not requested for 2004	data not requested for 2004	0	0
Class B lime/alkaline	data not requested for 2004	data not requested for 2004	3	880
Composting	1	no data	1	3,398
Thermal (e.g. heat drying, not incineration/gasification/pyrolysis)	0	no data	0	0
Gasification	data not requested for 2004	data not requested for 2004	0	0
Pyrolysis	data not requested for 2004	data not requested for 2004	0	0
Hydrolysis (thermal, chemical, etc.)	data not requested for 2004	data not requested for 2004	0	N/A
Long-term (bags, need beds, etc.)	0	no data	0	N/A
Oxidation ditch / extended aeration	data not requested for 2004	data not requested for 2004	0	N/A
Other stabilization technology	0	no data	1	13,398
Dewatering				
Belt Filter Press	4	no data	11	65,676
Plate & Frame Press	0	no data	2	4,614
Screw Press	0	no data	1	119
Centrifuge	3	no data	5	27,242
Vacuum Filter	5	no data	0	0
Drying beds (open-air)	25	no data	9	12,548
Solar drying (e.g. in greenhouses)	data not requested for 2004	data not requested for 2004	0	0
Other dewatering technology	0	no data	8	1,435
Thickening				
Gravity thickener	data not requested for 2004	data not requested for 2004	9	19,579
Gravity belt thickener (GBT)	data not requested for 2004	data not requested for 2004	6	2,013
Centrifuge	data not requested for 2004	data not requested for 2004	1	968
Dissolved air flotation (DAF)	data not requested for 2004	data not requested for 2004	5	15,796
Other thickening technology	data not requested for 2004	data not requested for 2004	12	5,002
Other				
Biosolids sold in bags (explain at right what size bags)	data not requested for 2004	data not requested for 2004	0	0

Cedar Rapids WWTP sends sewage sludge to incineration. It used low pressure oxidation (LPO) on secondary sludge to stabilize sludge. They produced 13,398 dry tons of sludge in 2016. The "Other" stabilization technology (row 88) is this LPO. "Other" dewatering technologies include need beds, rotary press, Fourrier Press, and more. "Other" thickening technology includes rotary drum thickeners.

State Pollutant (trace metal, etc.) Concentration Limits in Biosolids Applied to Land, 2018

Enter numbers only where state limits differed in 2018 from U.S. EPA limits.

	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Selenium (Se)	Zinc (Zn)
EPA Table 1 (mg/kg)	75	85		4300	840	57	75	420	100	7500
EPA Table 3 (mg/kg) & CPLR (ppb/a)	41	39		1500	300	17		420	36 (CPLR = 100)	2800
State ceiling limit (higher limit) (mg/kg)										
State high quality (lower number) limit (mg/kg)										
State CPLR (ppb/a)										
State APLR (ppb/a/365days)										

TESTING

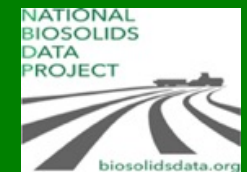
For each of the following constituents, indicate if testing is required by your state, as of 2018.	Is testing required for all sewage sludge or biosolids?	Or is testing required only for biosolids being beneficially used as fertilizers and soil amendments?	Frequency of testing (indicate how often testing must be done for each parameter):		If frequency depends on wastewater flow or amount of biosolids used or disposed of, please specify:
			In accordance with Part 503 requirements	In accordance with other frequency required by state (if applicable, please specify)	
Part 503 metals (As, Cu, Hg, etc.)	no	yes	yes		
Other metals (boron, silver...)	no	no	no		
Dioxins/furans	no	no	no		
PCBs	no	no	no		
Priority pollutants (https://www.epa.gov/sites/production/files/2015-09/documents/priority-pollutant-list-epa.pdf)	no	no	no		
Other organic compounds (e.g. PCBs, pharmaceuticals)	no	no	no		
Radioactive isotopes (alpha, beta, Ra 226, etc.)	no	no	no		
Nutrients (NPK)	no	yes	yes		
Pathogen reduction (Class A or B)	no	yes	yes		
Vector attraction reduction (VAR)	no	yes	yes		
PFAS (as of 2018)	no	no	no		
Microplastics (as of 2018)	no	no	no		
TCLP (toxicity characteristic leaching procedure)	no	no	no		
Paint Filter Liquids Test	no	no	no		

Iowa biosolids testing parameters, limits, and testing frequency are identical to 40 CFR 503.

REPORTING

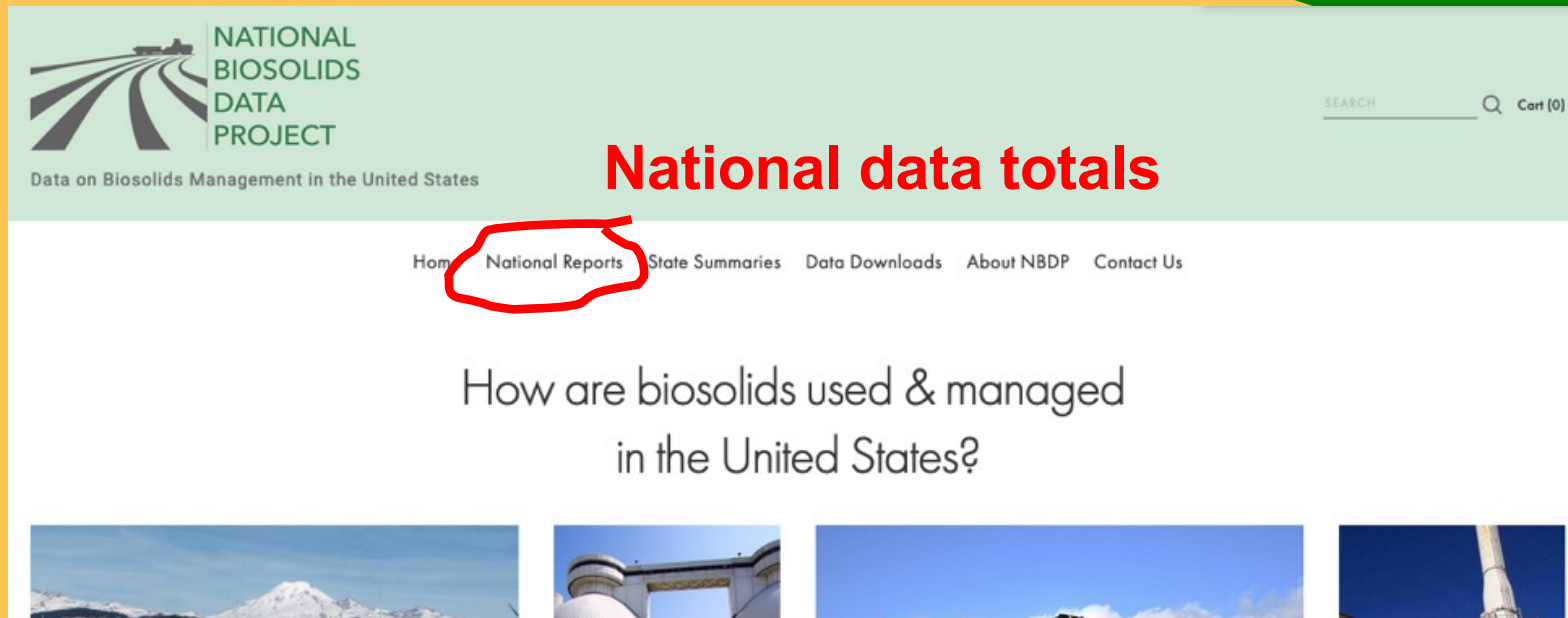
For each of the following, indicate what WWTPs and/or biosolids preparers must report to the state:	Is reporting to the state required for these parameters?	Frequency of reporting (indicate how often testing must be done for each parameter):		How are these data stored by the state?	Are data compiled by the state in reports or summaries? If so, please attach.
		In accordance with Part 503 requirements	In accordance with other frequency required (if applicable, please specify)		
The amounts of biosolids/sewage sludge used or disposed	yes	yes		electronic	yes
Part 503 metals (As, Cu, Hg, etc.)	yes	yes		electronic	yes
Other metals (boron, silver...)	no	not applicable (N/A)		not applicable (N/A)	no
Dioxins/furans	no	not applicable (N/A)		not applicable (N/A)	no
PCBs	no	not applicable (N/A)		not applicable (N/A)	no
Priority pollutants (https://www.epa.gov/sites/production/files/2015-09/documents/priority-pollutant-list-epa.pdf)	no	not applicable (N/A)		not applicable (N/A)	no
Other organic compounds (e.g. PCBs, pharmaceuticals)	no	not applicable (N/A)		not applicable (N/A)	no
Radioactive isotopes (alpha, beta, Ra 226, etc.)	no	not applicable (N/A)		not applicable (N/A)	no
Nutrients (NPK)	yes	yes		electronic	yes
Cumulative Pollutant Loading Rates (CPLR)	yes	yes		electronic	yes
How biosolids achieve Class A or Class B	yes	yes		electronic	yes
How biosolids achieve vector attraction reduction (VAR)	yes	yes		electronic	yes
Solids stabilization process(es) used	yes	yes		electronic	yes
Other biosolids treatments	yes	yes		electronic	yes
Land use or disposal practices	yes	yes		electronic	yes
PFAS (as of 2018)	no	not applicable (N/A)		not applicable (N/A)	no
Microplastics (as of 2018)	no	not applicable (N/A)		not applicable (N/A)	no
TCLP (toxicity characteristic leaching procedure)	no	not applicable (N/A)		not applicable (N/A)	no
Paint Filter Liquids Test	no	not applicable (N/A)		not applicable (N/A)	no

Iowa biosolids regulation only has a land application rule. Iowa does not have surface disposal and incineration rules. Landfilling is discouraged. Iowa's biosolids land application rule mirrors federal 40 CFR 503 in most areas, but includes a few best management practices that suit the state's agricultural and land use conditions. In 2018, Iowa changed the biosolids annual reports submittal requirements from paper reporting to electronic reporting. For the forms and data in the annual report that are required by EPA biosolids annual electronic reporting, Iowa asks the same of WWTPs. WWTPs can use EPA's report to satisfy state reporting needs. For the information that is not required by EPA, Iowa developed a supplemental form for WWTPs to submit. Information in this supplemental report covers: the location of land application sites, total annual biosolids applied on each site, size of the parcel, etc. CPLR needs to be developed if any limit in 40 CFR Part 503 Table 3 is exceeded by a WWTP.



RESULTS

Results at www.biosolidsdata.org



The screenshot shows the homepage of the National Biosolids Data Project. The header includes the logo, the text "NATIONAL BIOSOLIDS DATA PROJECT", and the tagline "Data on Biosolids Management in the United States". A search bar and a cart icon are also present. The main navigation menu includes "Home", "National Reports", "State Summaries", "Data Downloads", "About NBDP", and "Contact Us". The "National Reports" link is circled in red. Below the navigation, the main heading reads "How are biosolids used & managed in the United States?". At the bottom, there are four small images related to biosolids management.

NATIONAL BIOSOLIDS DATA PROJECT
Data on Biosolids Management in the United States

SEARCH Cart (0)

Home **National Reports** State Summaries Data Downloads About NBDP Contact Us

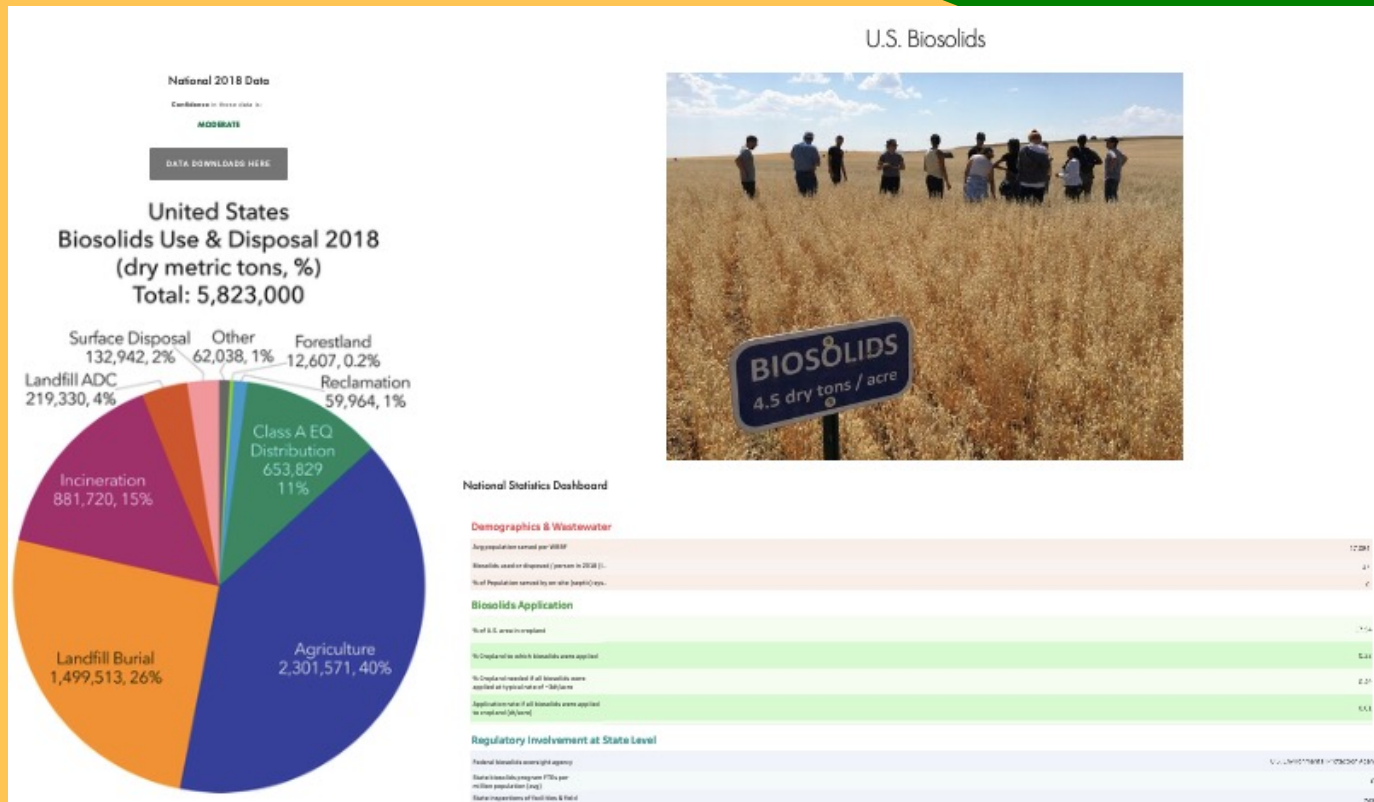
How are biosolids used & managed in the United States?

a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).



Navigating nationwide data

Project Website: www.biosolidsdata.org – Nationwide Data



a National Biosolids Data Project presentation • August 5, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).



Navigating nationwide data

Project Website: www.biosolidsdata.org

Nationwide Biosolids Data Totals

NATIONAL BIOSOLIDS DATA PROJECT		NATIONAL BIOSOLIDS SURVEY		2018 data conducted 2020-2021 biosolidsdata.org	
U.S. National Biosolids Data					
Infrastructure & Wastewater					
		2004 Data	2018 Data		
		8,778 (from NBDP state surveys), 16,824 (based on Clean Water Act Needs Survey (CWNS))	14,800 (from NBDP state surveys), 15,000 (based on CWNS), 2017, based on CWNS)		
Total Number of WRRF's (WWTP's)					
WRRF & Biosolids Infrastructure Totals					
Number of separate wastewater treatment plants that further treat biosolids, meeting Class B or A?					
Total number of WRRF's sending to those separate treatment plants		100	100		
Number of operating sludge incinerators (total)		50	100		
Total capacity		24	43		
Number of Part 503 benefits accepting separate sludge		data not requested for 2004	insufficient data		
Number of WRRF's with industrial pre-treatment programs		data not requested for 2004	insufficient data		
Number of WRRF's with sludge lagoons		data not requested for 2004	insufficient data		
Wastewater Flow Totals					
Total national average daily wastewater flow (ADWF)		data not requested for 2004	32,600		
Total national WRRF design capacity for wastewater flow (MGD)		data not requested for 2004	insufficient data		
Total national average daily dry weather flow (MGD)		data not requested for 2004	insufficient data		
Other Totals					
Number of documented odor & nuisance complaints received by states in 2018 related to biosolids transportation and use or disposal outside of the gates of the WRRF's		data not requested for 2004	insufficient data		
Number of WRRF's involved in those complaints		data not requested for 2004	insufficient data		
Percent of population served by on-site systems (i.e., septic systems)		data not available for 2004, see notes, 2018	27%		
Biosolids Use and Disposal					
UNITS:		Dry metric tons	Dry metric tons	Data data converted from dry U.S. tons reported in NEBRA et al. report, 2007.	
BIOSOLIDS USED OR DISPOSED, 2018 (adjusted total): 5,823,000					
Summary					
	Number of Entities in 2004 (WRRF's & Sep. Programs) Included in State Reports and Going To...	Quantity of Biosolids Included in 2004 State-by-State Reports and Going To...	Number of Entities (WRRF's & Sep. Programs) Included in 2018 State Reports and Going To...	Quantity of Biosolids Included in 2018 State-by-State Reports and Going To...	NOTE: Quantity of sewage sludge or biosolids used or disposed means the quantity that goes out the gate of the WRRF's. Quantities are in the units (the form of measurement) indicated above.
Beneficial Use (applied to soils, not including ADC)	4,633	3,177,285	3,600	3,028,000	The 2018 quantity (tonnage) data are from a more robust compilation in the national "database" spreadsheet. - The 2004 data have been converted to dry metric tons (DMT). - The total 2018 tonnage (5,823,000) includes the "other" which was solids used or disposed in 2018 but for which specific management was not known. (Include 11,000 dry for deep well injection in CA) in contrast, the "long-term storage" solids reported for 2004 were not used or disposed in 2004. So, for good comparison to 2018 data, those stored solids are not included in the 2004 totals here. - Numbers in the summary here are rounded to significant figures - 1000s of dry metric tons. The more precise numbers below are more accurate and could also be rounded to 1000s.
Disposal & Alternative Dispositions	1,149	981,588	1,500	62,000	
Other					
TOTAL	8,778	6,129,733	6,600	5,823,000	
Beneficial Use					
	Number of Entities in 2004 (WRRF's & Sep. Programs) Included in State Reports With Beneficial Use as Indicated	Quantity of Biosolids Included in 2004 State-by-State Reports and Beneficially Applied For...	Number of Entities (WRRF's & Sep. Programs) Included in 2018 State Reports With Beneficial Use as Indicated	Quantity of Biosolids Included in 2018 State-by-State Reports and Beneficially Applied For...	The 2018 quantity (tonnage) data are from a more robust compilation in the national "database" spreadsheet, except for the "long-term storage" tonnage which is an estimate from this spreadsheet tally of state reports. - The long-term storage tonnage for 2004 and 2018 are not included in any of the totals, because those biosolids were not used or disposed in 2018. - The number of acres to which biosolids were applied in 2018 were estimated by assuming that the total tonnage of beneficially-used biosolids in each state was applied at rate of 3 dry tons/acre, thus, the acreage estimated for each state = total beneficial use tonnage / 3. - In 2018, total U.S. cropland was 997 million acres. Thus, all beneficially used biosolids in 2018 were applied to less than 0.3% of U.S. cropland. - NBDP estimates that if all U.S. biosolids (including those disposed of in 2018) were applied to land, it would require ~0.5% of U.S. cropland.
Agricultural (EQ, Class A, & Class B)	3,099	2,374,437	3,000	2,301,571	
Forestland (EQ, Class A, & Class B)	38	23,992	35	12,897	
Recreation (EQ, Class A, & Class B)	54	82,868	40	59,944	
Class A EQ Distribution (Sewage or bath, public distribution, or animal waste & feed)	440	688,738	700	853,818	
Beneficial Use Subtotal	4,461	3,177,280	3,600	3,028,000	
Long-term storage	1,149	981,588	800	228,000	
Number of acres to which biosolids were applied:				1,658,000	
Disposal & Alternative Dispositions					
	Number of Entities in 2004 (WRRF's & Sep. Programs) Included in State Reports With Disposal As Indicated	Quantity of Biosolids Included in 2004 State-by-State Reports and Disposed as Indicated	Number of Entities (WRRF's & Sep. Programs) Included in 2018 State Reports With Disposal As Indicated	Quantity of Biosolids Included in 2018 State-by-State Reports and Disposed as Indicated	
Landfill (total)	2,800	1,855,322	2,800	1,718,843	
Other	data not requested for 2004	data not requested for 2004	1,267	1,469,513	

a National Biosolids Data Project presentation • August 5, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/ata-downloads>.


Permission granted for use in accordance with [Data Use Policy](#).

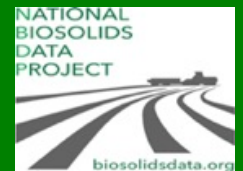


Navigating nationwide data

Project Website: www.biosolidsdata.org

Nationwide Dashboard

	
DASHBOARD United States Biosolids Statistics	
Data Quality & Methods 2018	
<p>Quality & Confidence in U.S. data: Data sources & methods: U.S. biosolids generated, as reported in 2018 EPA ECHO data (%)</p>	<p>Moderate <i>See NBDP final report & methods.</i> 76% % of total biosolids reported in ECHO (corrected from >8 million dmt due to errors (see explanation at right) to 4,402,000) vs. the total presented here by NBDP (5,823,000 dmt)). ECHO data for 2018 are from 2,307 WRRFs reporting.</p>
<p>Demographics & Wastewater U.S. population (sum of state populations reported in NBDP state spreadsheets) Total land area in state (acres): Population density (persons/square mile): Total number of WRRFs reported in state surveys (nationwide total): total number of WRRFs permitted/reported elsewhere: number of WRRFs in EPA ECHO reports for 2018: Average population served per WRRF:</p> <p>Average daily wastewater flow nationwide (MGD, NBDP): Average wastewater flow nationwide (MGD, Seiple): Sum of the number of WRRFs that treat >75% of each state's flow: % of population served by on-site (septic) systems: Biosolids used or disposed / person in 2018 (lbs):</p>	<p>330,912,941 2,280,471,631 93 14,718 15,008 2,305 incomplete data</p> <p>sum of state-by-state report estimates; data not available for 14 states & territories, making this a low number 34,369 1,435 24% 37</p> <p>based on sum of estimates for 49 of 53 states & territories weighted average of all states</p>
<p>Biosolids Application Agricultural land cropland in the U.S. (acres): % of national area in cropland:</p> <p>Number of farms with that cropland: % cropland to which biosolids were applied: Application rate if all U. S. biosolids were applied to cropland (dry tons/ac.): % cropland needed if all U. S. biosolids were applied at typical rate (~3 dt/ac):</p>	<p>sum of acreages reported state-by-state in 396,955,343 NBDP spreadsheets, based on USDA data 17%</p> <p>sum of numbers reported state-by-state in 1,503,068 NBDP spreadsheets, based on USDA data incomplete data 0.01 0.49%</p>
<p>explanations & sources ranking by NBDP survey team based on information provided in state surveys (options: High, Moderate, Low, None)</p> <p>https://echo.epa.gov/facilities/facility-search?mediaSelected=bioAnnual - The EPA ECHO data for 2018 adds up to >8 million dmt because of several data errors, including a small CT WRRF reporting more than 3 million dmt and double-counting of solids when separate preparers also report in ECHO, as is the case in the CA ECHO data.</p> <p>U.S. Census estimate for July 1, 2018 https://www.census.gov/research/topics/2018-population.html calculated NBDP state-by-state survey responses Seiple et al., 2017, based on CWNS 2012+ https://www.epa.gov/cwns/cwns-2012 calculated NBDP state-by-state survey responses Seiple et al., 2020 https://doi.org/10.1016/j.jenvman.2020.110852 Seiple et al., 2020 https://doi.org/10.1016/j.jenvman.2020.110853 survey response by state expert calculated</p> <p>sum of acreages reported state-by-state in 396,955,343 NBDP spreadsheets, based on USDA data https://bulkECHO201808040729am0C0B00846032-3726-48b5-82c8a57441 calculated sum of numbers reported state-by-state in 1,503,068 NBDP spreadsheets, based on USDA data https://bulkECHO201808040729am0C0B00846032-3726-48b5-82c8a57441 calculated calculated calculated</p>	





*Tour at Boulder Park,
King County WA
biosolids program*



More Results



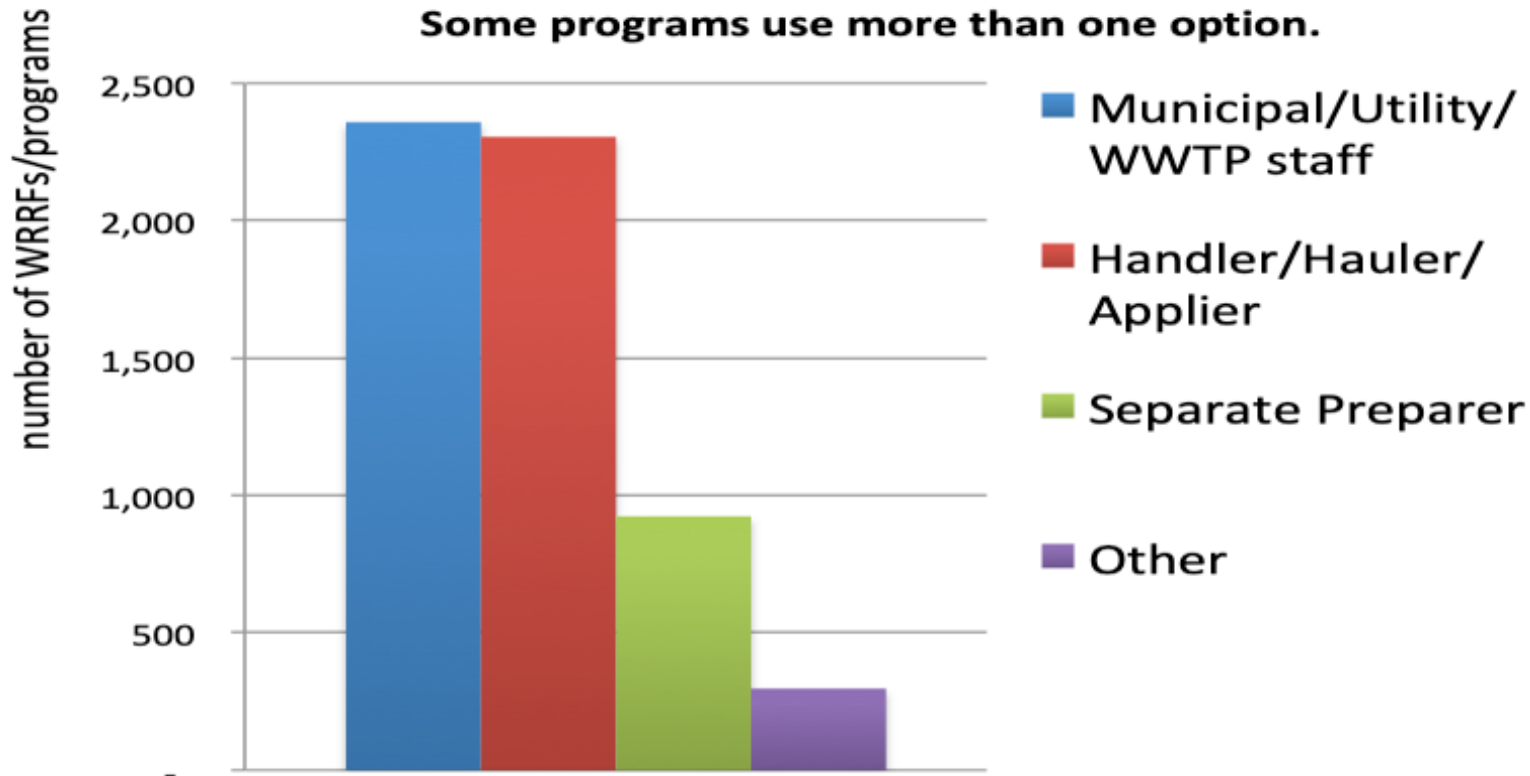
*Rotary drum
dryer, South
Cary, NC*

*Wastewater
solids (SSI)
incinerator,
St. Paul, MN*



WHO MANAGES THE BIOSOLIDS?

Relative numbers of WRRFs programs, extrapolated from
NBDP WRRF survey responses (n = 452)
Some programs use more than one option.



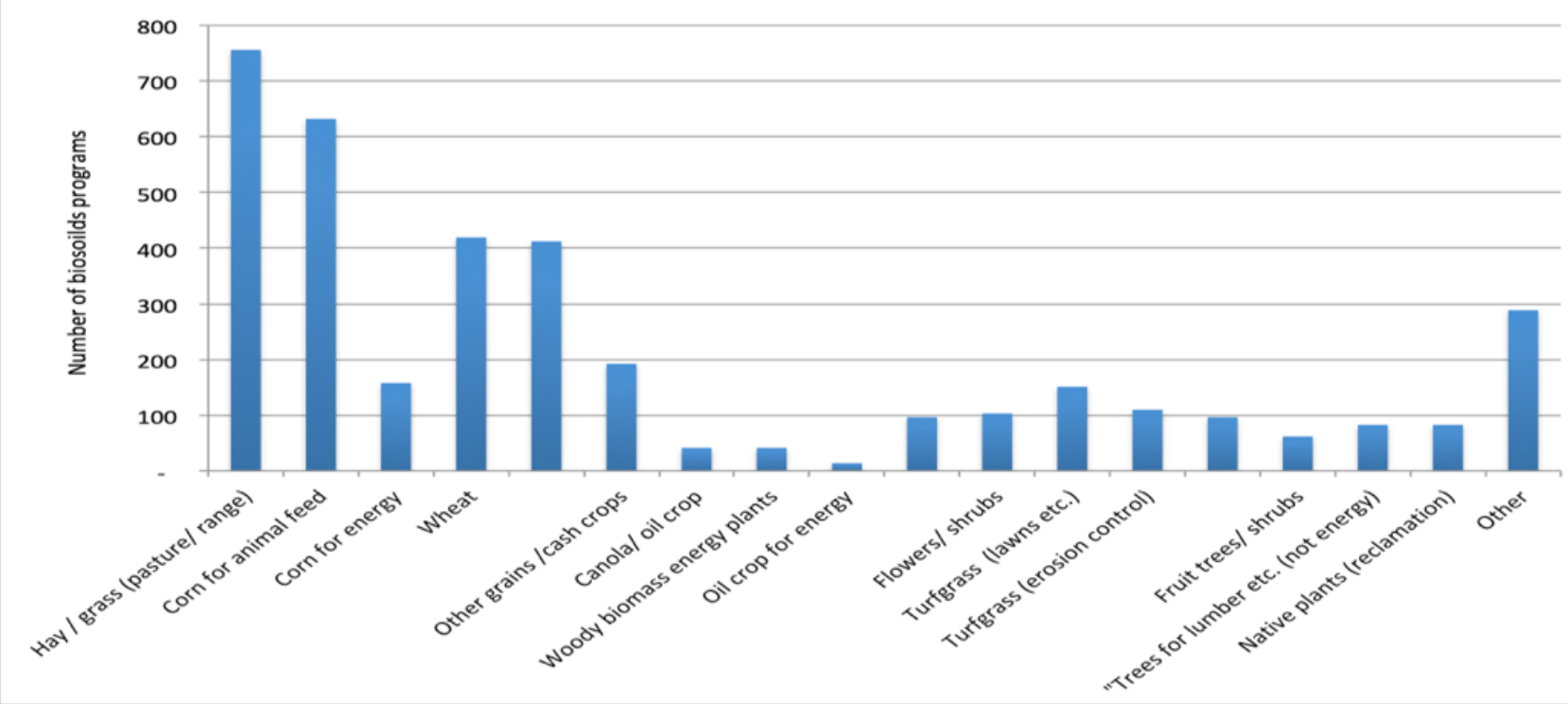
a National Biosolids Data Project presentation • June 24, 2022

A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.

Permission granted for use in accordance with [Data Use Policy](#).

WHAT CROPS ARE GROWN WITH BIOSOLIDS?

Number of U. S. biosolids programs growing each crop
(extrapolated to a nationwide estimate for the 3,740 major (>1 MGD) WRRFs and based on % of each option chosen by 197 respondents from across the U. S.)
These numbers are estimates; what counts are the relative amounts.



a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).

Acres Permitted & Used for Biosolids

- Acres permitted for biosolids land application (permits mostly only required for Class B, n = 144):

69,838,000* acres

(out of 396,434,000 acres (18%) of agricultural land in the U. S., & likely less because some permitted acreage is double-counted)

- Acres actually applied to in 2018 (n = 149):

4,562,000* acres (6.5% of permitted, 1.15% of all ag land)

*These totals are extrapolated for the whole U. S. based on survey responses representing 34% of of U. S. wastewater flow.

Example: King County

“533, 891 = total permitted acres for all of King County's biosolids (3 regional treatment plants) and biosolids projects (King County manages a beneficial use facility so this includes permitted acres for other agencies' biosolids too..... Specific individual sites are approved by the Washington State Department of Ecology for land application each year, then applied.

“9,319 = total acres applied with King County's biosolids (3 regional treatment plants).

A bounty of farmland...



“We are in Kansas, so there is an unlimited amount of farm land that we can apply on. Kansas doesn't have state biosolids regulations so we fall strictly under the 503 regs, which does not require site-by-site permitting. Within 100 miles of the Kansas City Metro area, there are 10's of thousands of acres of suitable crop ground to land apply on. Most of our haul distances are around 30 miles or less.” –*Johnson County Wastewater, Kansas*

<https://www.jocogov.org/departments/wastewater>

Nutrients in Final Biosolids (n = 116)

Nitrogen %	Average (mean)	Maximum
Class A	3.4%	7%
Class B	4.8%	11%

Phosphorus %	Average (mean)	Maximum
Class A	2.3%	6%
Class B	2.0%	7%

Testing Requirements (n = 440)

- In 2018, did all of your biosolids meet Part 503 Table 3 (high quality) standards?
 - 330 Yes
 - 13 No
 - 73 Don't know or Not applicable
(no treatment going to landfill or incineration)

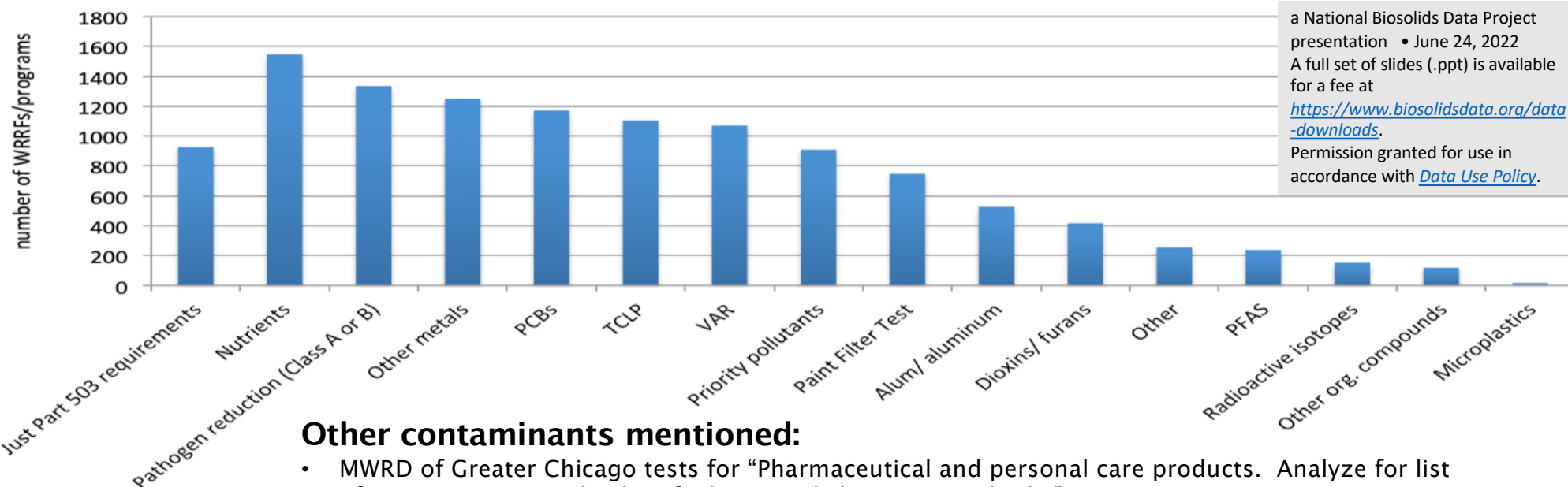


a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at
<https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).

EPA staff tour biosolids compost facility, Merrimack NH, 2018

WHAT CONTAMINANTS ARE TESTED FOR?

Numbers of WRRF/programs that must test for each item, extrapolated from NBDP survey of WRRFs (n= 440).
What counts is relative numbers.



a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).

Other contaminants mentioned:

- MWRD of Greater Chicago tests for “Pharmaceutical and personal care products. Analyze for list of organic compounds identified in IL soil clean up standards.”
- “phenols, cyanide”
- NH WRRF: “PFAS testing is not required, but we do test on our own to confirm we are not spreading hazardous/regulated waste at our site.”
- Southern TX city: “Each landfilled load tested for RCRA Non-Haz (+TCLP); ignitability, reactivity, and corrosivity, at landfill scale house”

Storage for Biosolids

- Do you have storage for your biosolids? (n = 53)
 - Yup (fortunately): 70%
 - Nope (not much wriggle room): 30%

“We rent ground at the airport to store the sludge. The airport has 1000 acres of alfalfa fields around it and is applied to the fields through the growing season by a farmer who rents them.”

–*Sioux City, Iowa*

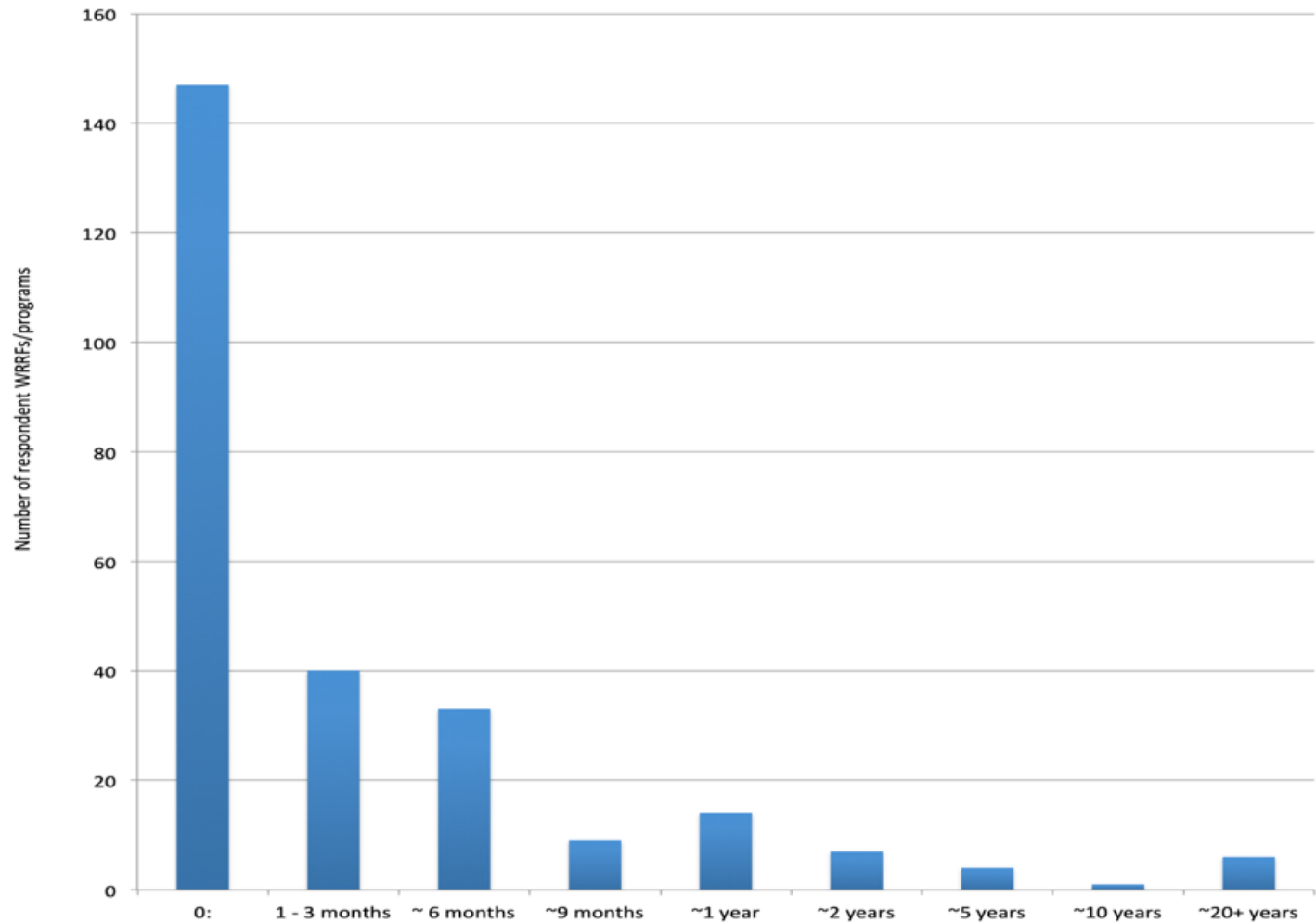
“3 onsite storage silos totaling ~390,000 lbs. Additional product stored in 1 ton supersacks.”
–*Pierce County Chambers Creek WRRF, WA*

“The holding bed is used to further dry solids before disposal. The bed is 173x 248 with a 4 ft block wall around. We spread sludge cake at a depth of 6-8 inches allow it to dry then pile for disposal.”

–*Village of Los Lunas, NM*

HOW LONG ARE BIOSOLIDS STORED? (n = 263)

The number of months or years each respondent WRRF biosolids program typically stores biosolids before use or disposal.



a National Biosolids Data Project presentation • June 24, 2022
A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
Permission granted for use in accordance with [Data Use Policy](#).

Comments about storage



- “the larger plants haul biosolids several times a month, while our smaller plants often only haul 1 load per year.” –*a large utility with multiple WRRFs in Alabama*
- “fluid process that varies, especially while holding a batch for land application while awaiting test results” –*Village of Essex Junction, VT*
- “Dewatered sludge cakes are stored underneath storage sheds during inclement weather.” –*Lower Poplar & Rocky Creek WRFs, Macon, GA*
- “Pellet holding time kept short to mitigate fire risks.” –*Arlington County WPCF, Virginia*
- “When afforded the opportunity during dry weather months, biosolids are dried in the drying beds prior to them being hauled away in an effort to reduce hauling costs.” –*WRRF NW of Los Angeles, CA*
- “Sludge remains in the solids storage basins for 3 to 5 years before they are land applied” –*Sacramento Regional Community Services District, CA*
- “The dewatered biosolids are trucked to the Twenty Mile South Biosolids Application Site and stored until it is convenient to apply (generally in spring and fall)” –*Boise, ID*
- We only store sewage sludge incinerator ash in lagoons. If we can't incinerate, sludge heads to the landfill immediately.
- Incineration: 0 Class A EQ: 1 - 3 months Class B: 6- 12 Months –*a city in southern MN*
- “When the farmers call - just before spring or fall planting.” –*Ephrata Area Wastewater Treatment Facility, Ephrata, PA*

a National Biosolids Data Project presentation • June 24, 2022

A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.

Permission granted for use in accordance with [Data Use Policy](#).

Facts & Figures: Energy



- AD tank capacity of 88 WRRF survey respondents:
1.285 billion gallons
- Do they have excess capacity?

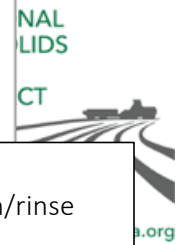
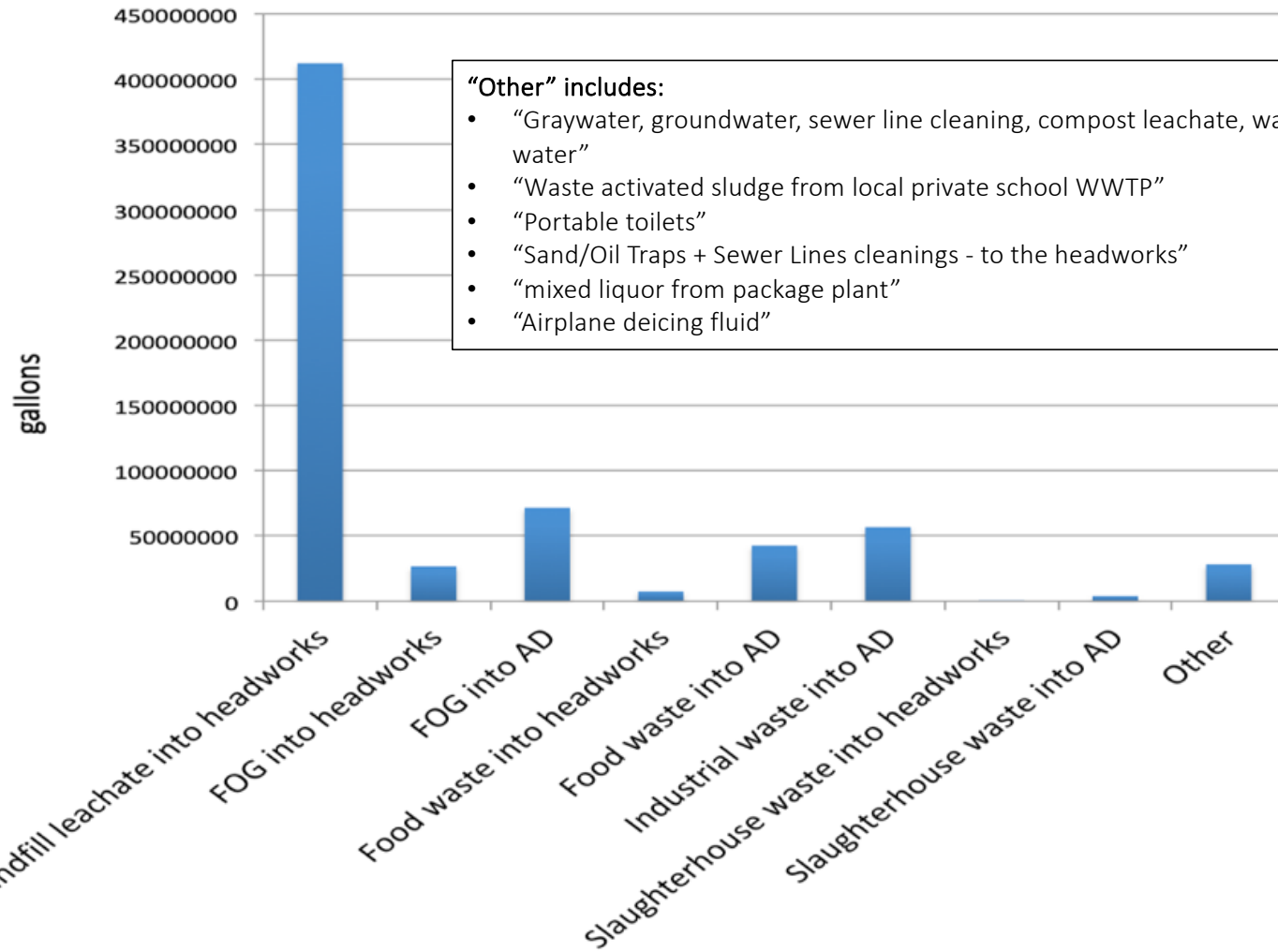
% of AD Capacity In Use Already	Number of WRRF respondents
WRRFs at 100%:	35
WRRFs at 80-99%:	18
WRRFs at >50-79%:	39
WRRFs at <50%:	2

- On average, these WRRFs use 86% of AD capacity.
- Excess capacity for co-digestion?
 - YES: 26 WRRFs NO: 34 WRRFs MAYBE: 36 WRRFs

About Outside Wastes

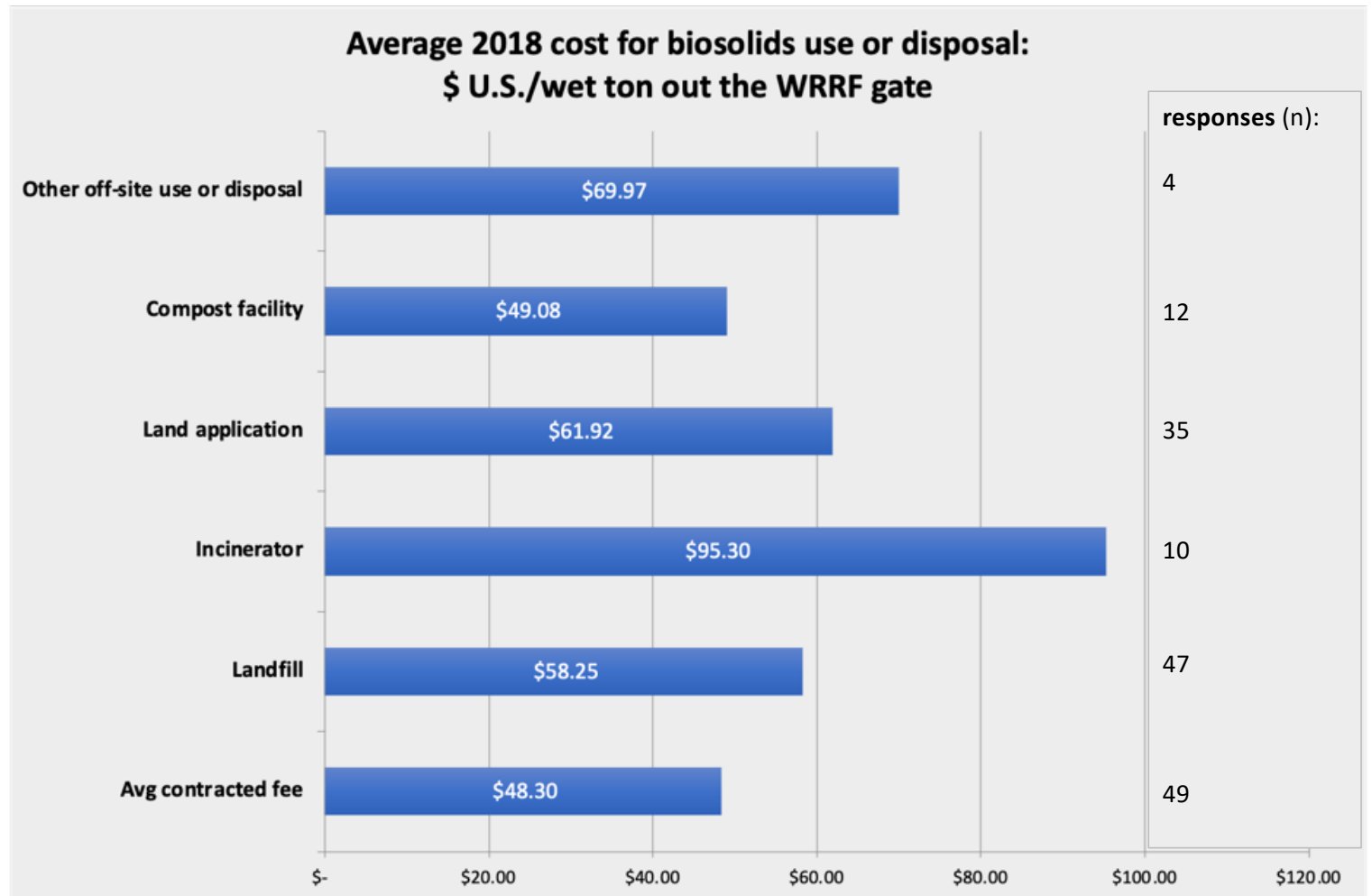
- **Septage** received in 2018 (n = 128 respondents):
594,588,942 gallons
- **Active industrial pretreatment?** (n = 266)
Yes: 189
No: 77
- **Industrial users** included in the 189 programs above:
29,458
~17,000 of them at the Hyperion Water Reclamation Plant, Los Angeles, CA
Average per WRRF (not including Hyperion): 66

TRUCKED-IN WASTE RECEIVED (n = 80)



a National Biosolids Data Project presentation • June 24, 2022
 A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
 Permission granted for use in accordance with [Data Use Policy](#).

WRRF Average End-Use or Disposal Cost

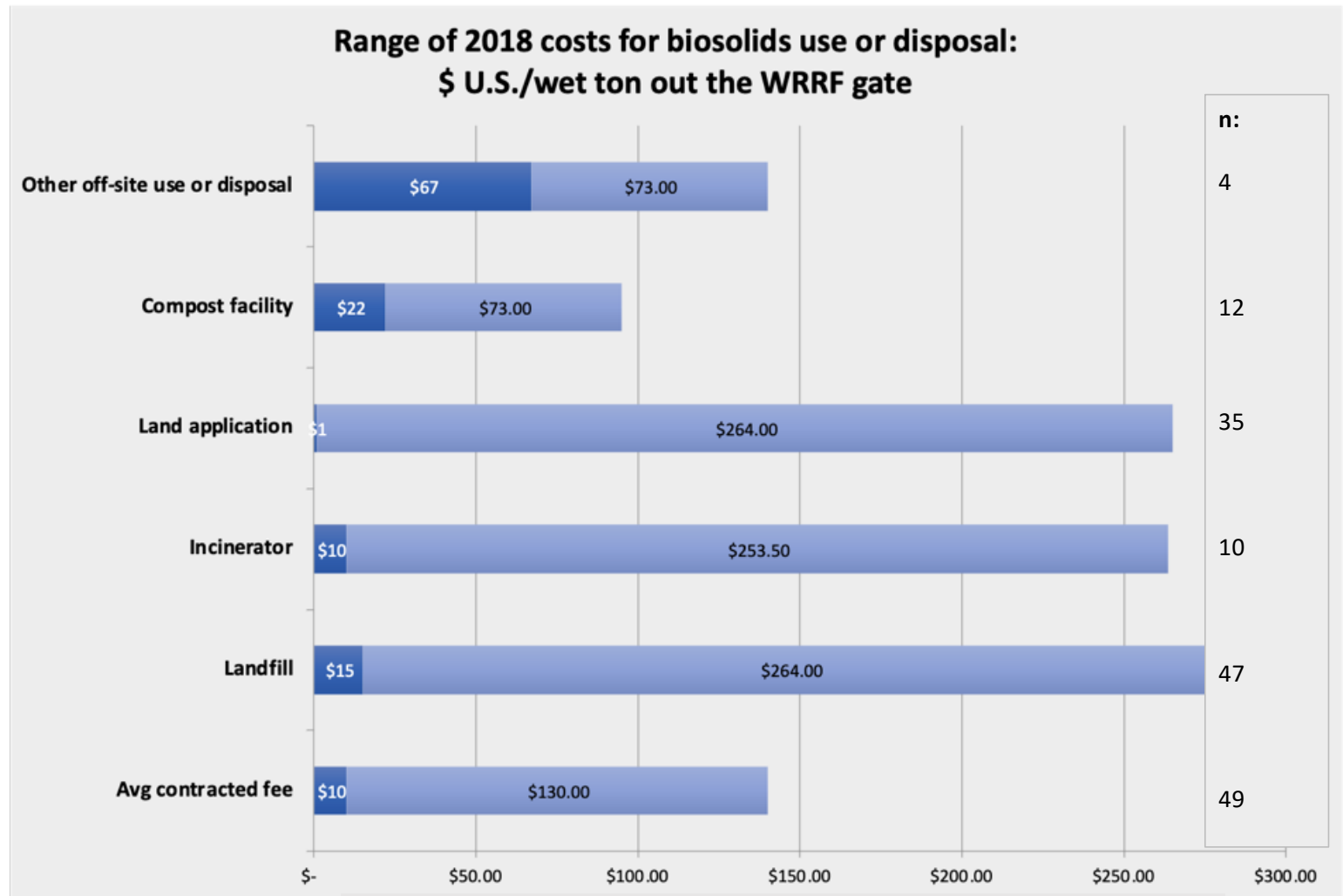


a National Biosolids Data Project presentation • June 24, 2022

A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.

Permission granted for use in accordance with [Data Use Policy](#).

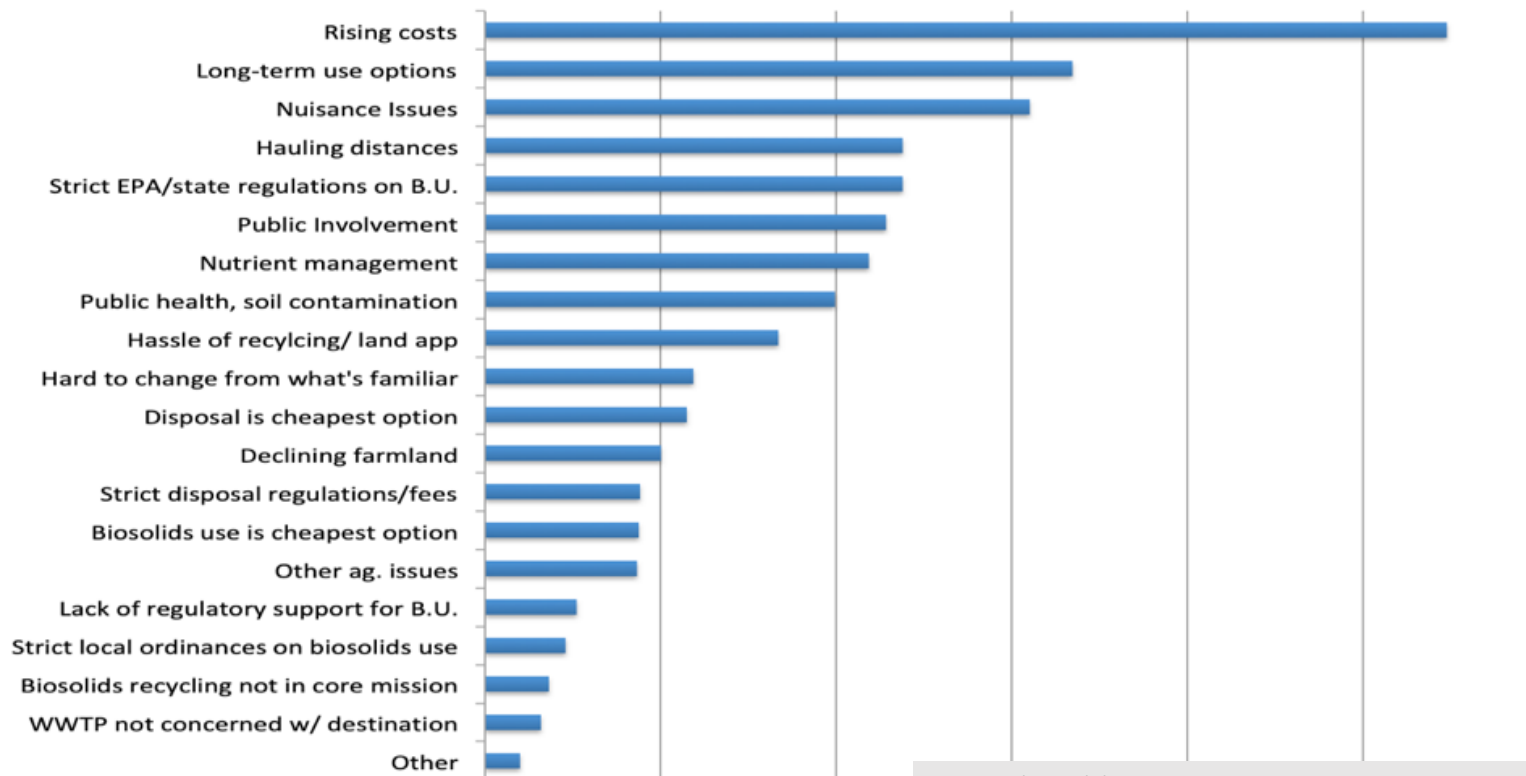
WRRF Range of End-Use or Disposal Costs



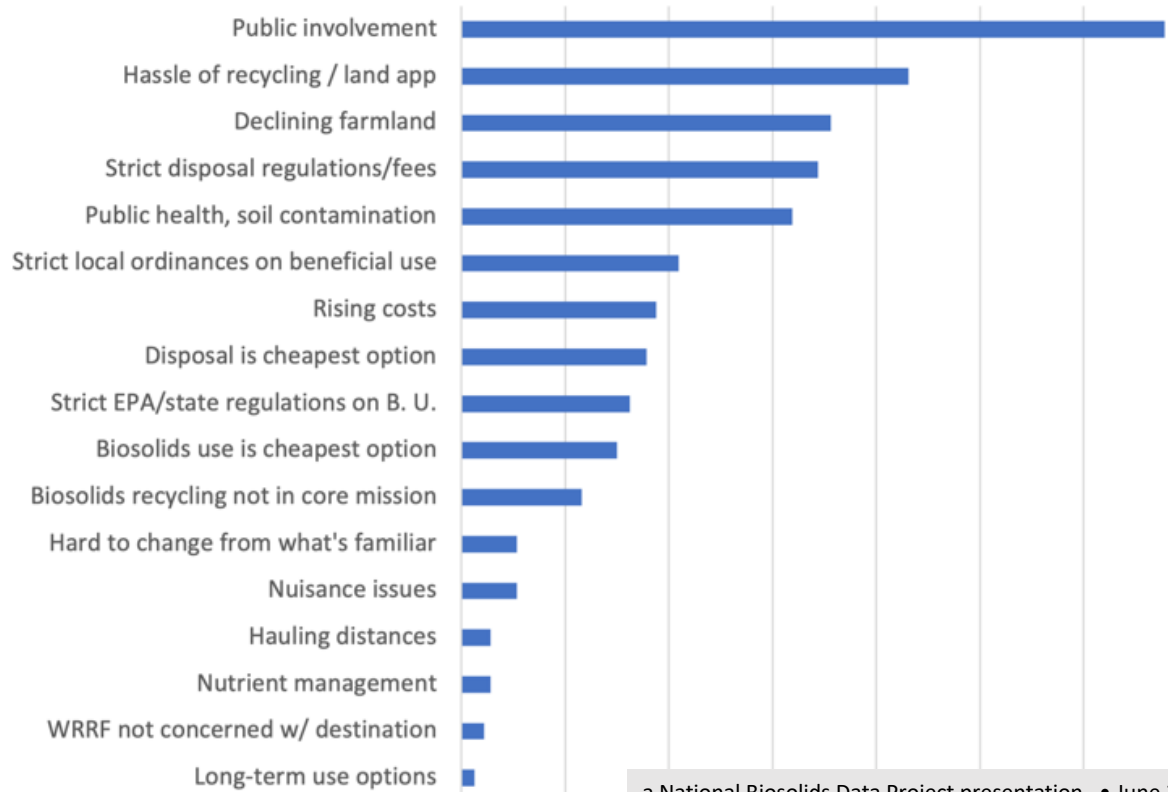
a National Biosolids Data Project presentation • June 24, 2022
 A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
 Permission granted for use in accordance with [Data Use Policy](#).

TOP 5 PRESSURES ON BIOSOLIDS PROGRAMS

Top pressures were selected by WRRF programs from list provided in NBDP WRRF Survey (n = 155 respondents). Each bar below is the sum of the total selections, with weighting factors applied: 10x for #1 choice, 5x for #2 choice, etc. down to .625x for #5 choice.



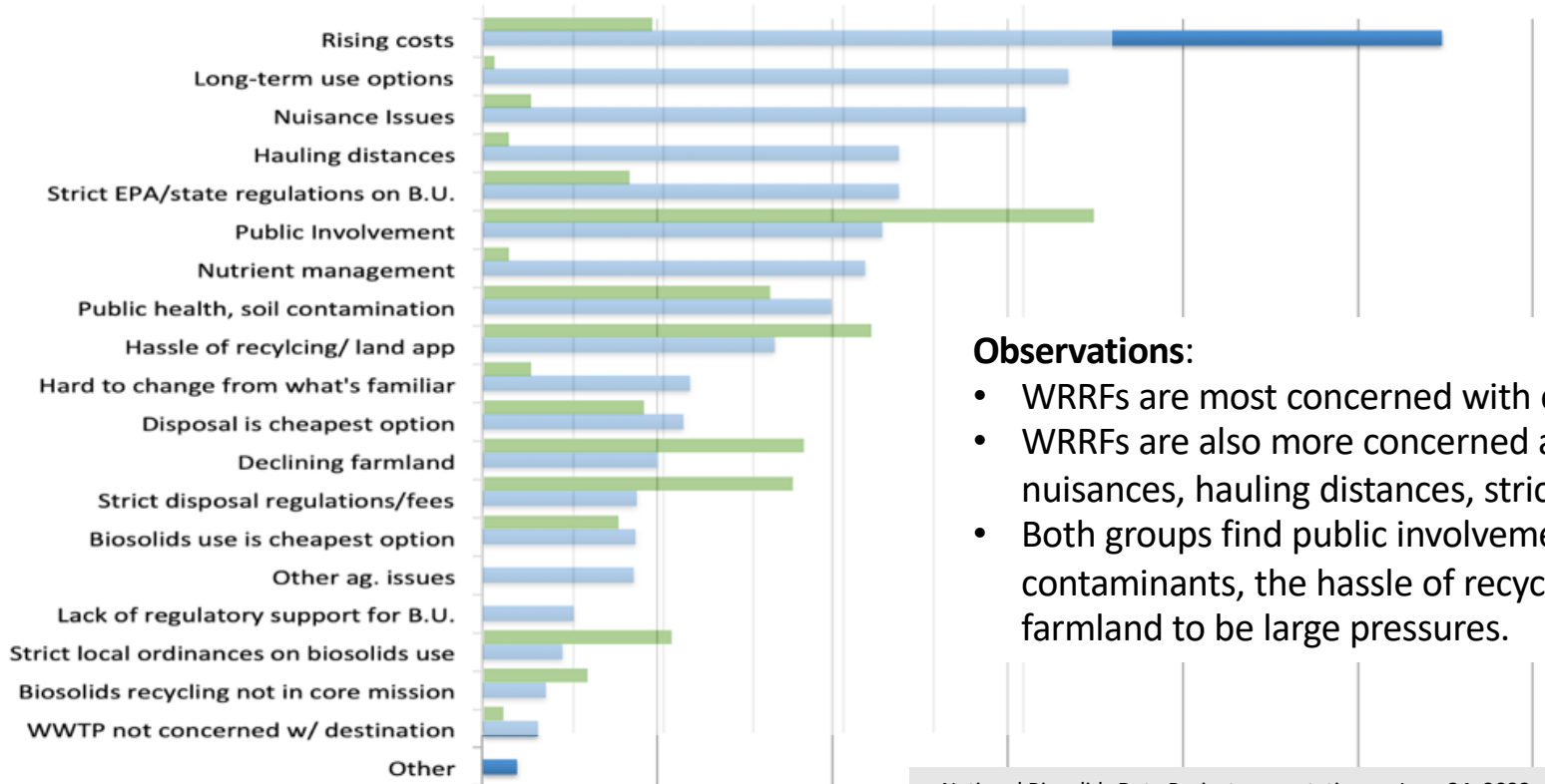
TOP 5 PRESSURES ON BIOSOLIDS PROGRAMS
 Top pressures were selected by state biosolids coordinators
 (experts) from list provided in NBDP State Survey.
 (n = 51 respondents).



a National Biosolids Data Project presentation • June 24, 2022
 A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
 Permission granted for use in accordance with [Data Use Policy](#).

TOP 5 PRESSURES ON BIOSOLIDS PROGRAMS

WRRF survey respondents (blue, n = 155 respondents) and state biosolids coordinators (green, n = 51 respondents) selected the following top pressures on biosolids programs from a list provided in the NBDP surveys.



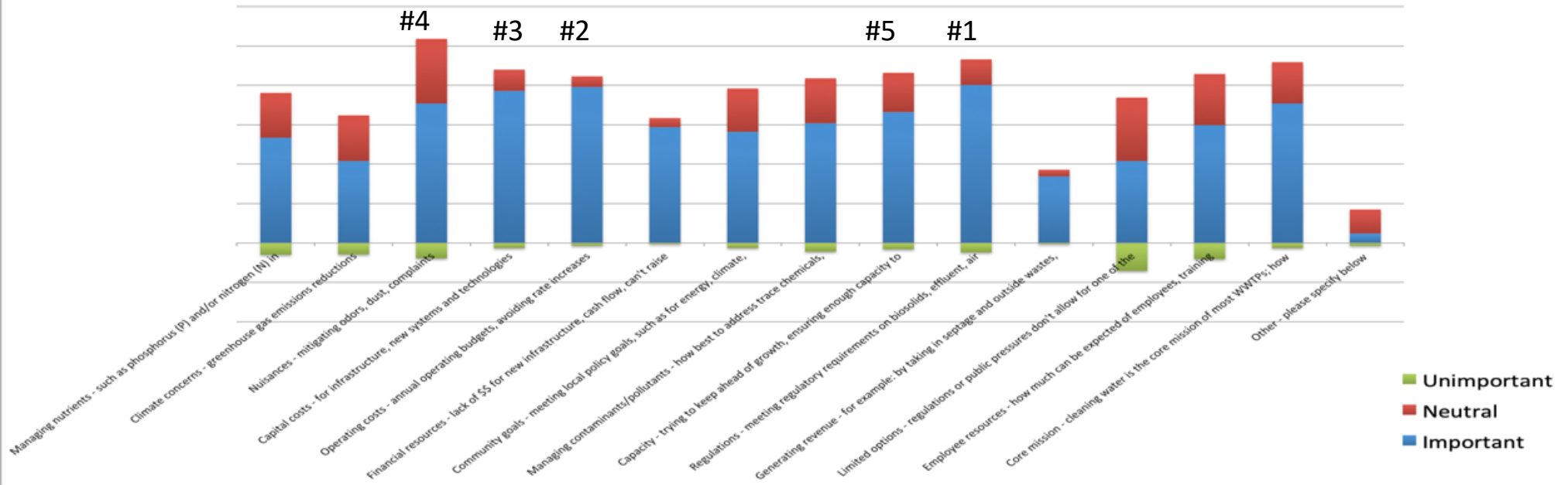
Observations:

- WRRFs are most concerned with costs & future outlets.
- WRRFs are also more concerned about practical issues: nuisances, hauling distances, strict regulations, nutrients
- Both groups find public involvement, public health / contaminants, the hassle of recycling, and declining farmland to be large pressures.

a National Biosolids Data Project presentation • June 24, 2022
 A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
 Permission granted for use in accordance with [Data Use Policy](#).

WHAT ISSUES ARE IMPORTANT IN DECISIONS REGARDING BIOSOLIDS MANAGEMENT?

Issues selected, from a list of choices, by NBDP WRRF survey respondents (n = 423).



Most important:

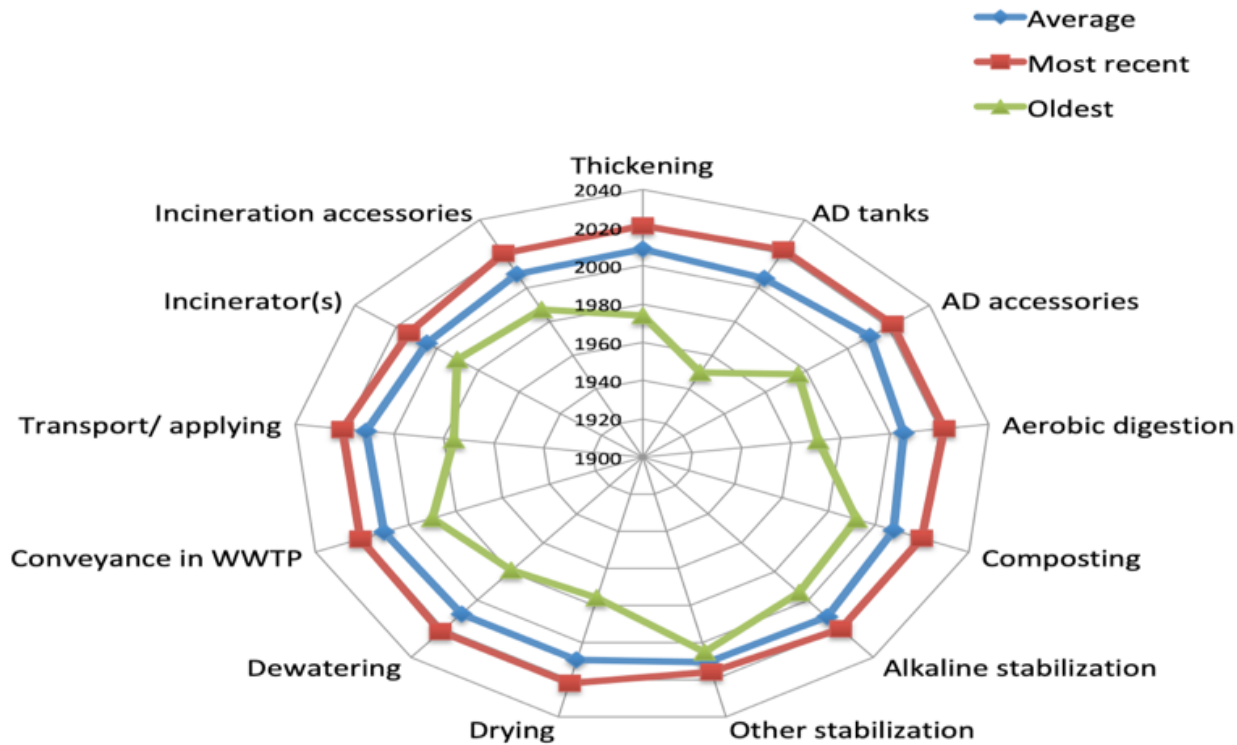
1. Meeting regulatory requirements
2. Operating costs
3. Capital costs
4. Nuisances
5. Ensuring enough capacity

Most unimportant:

1. Limited options - regulations or public pressures don't allow for one of the 3 options
2. Employee resources - how much can be expected of employees, training
3. Nuisances

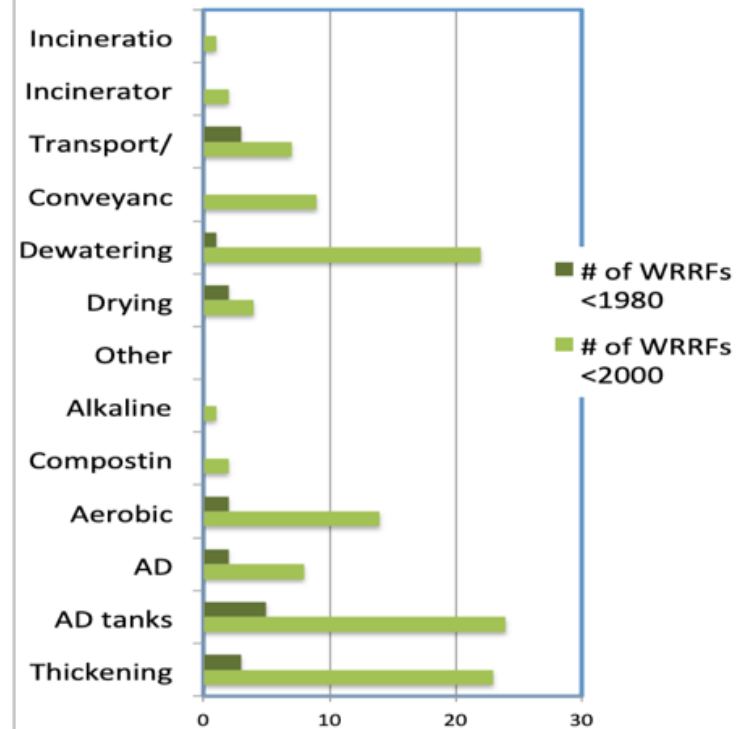
a National Biosolids Data Project presentation • June 24, 2022
 A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
 Permission granted for use in accordance with [Data Use Policy](#).

MOST RECENT UPGRADES / AGE OF INFRASTRUCTURE (n = 137)



NATIONAL BIOSOLIDS DATA

NUMBER OF WRRFS WITH SYSTEMS PRE-2000 & PRE-1980



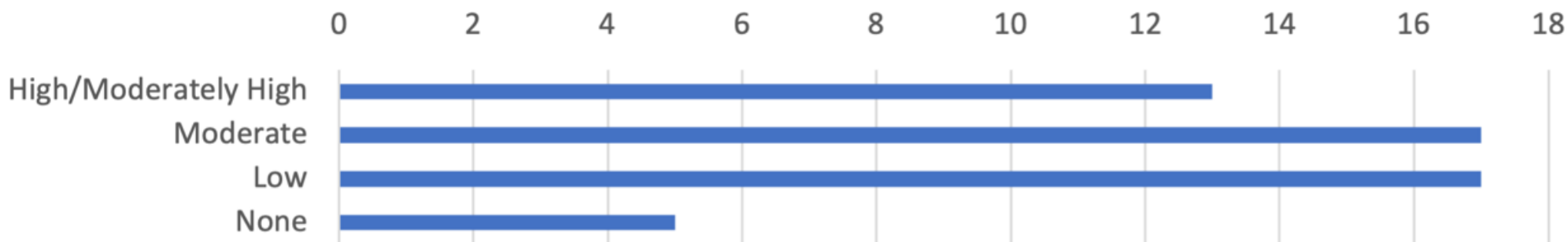
a National Biosolids Data Project presentation • June 24, 2022
 A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.
 Permission granted for use in accordance with [Data Use Policy](#).

How involved are states?

The NBDP project team assessed the level of involvement of each state in a number of ways. For example, in this case, they estimated the level of state regulation above and beyond the federal U. S. EPA Part 503 regulations.



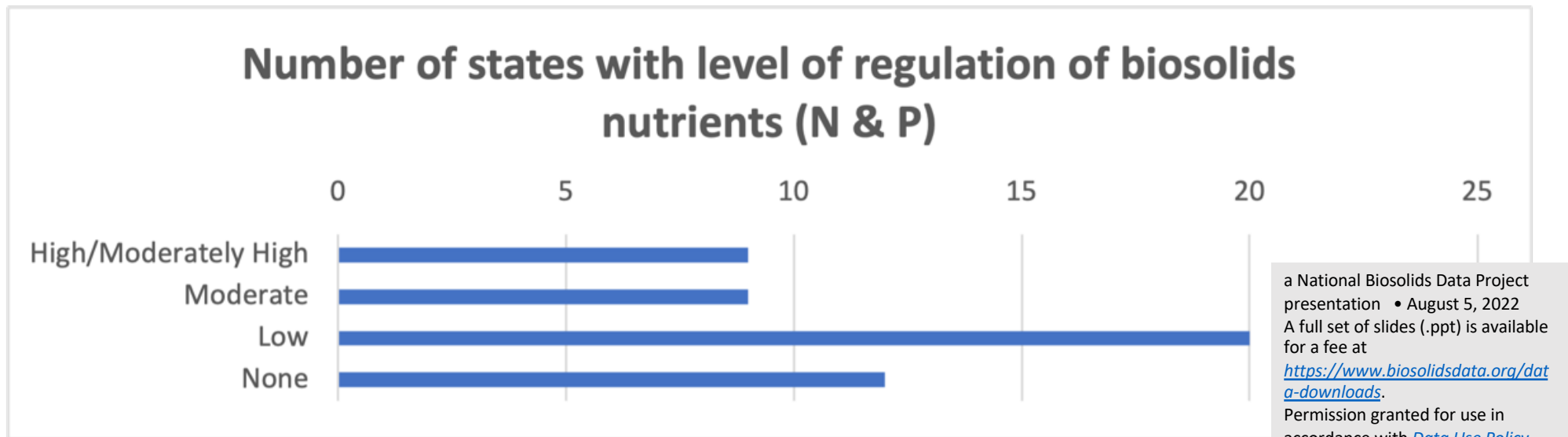
Number of states with level of regulation beyond Part 503



30 states have at least moderate state regulations that go above and beyond the Part 503 regulations. Only ~5 have no state regulations.

How involved are states?

Here is the NBDP's assessment of states' regulations related to biosolids nutrient management.



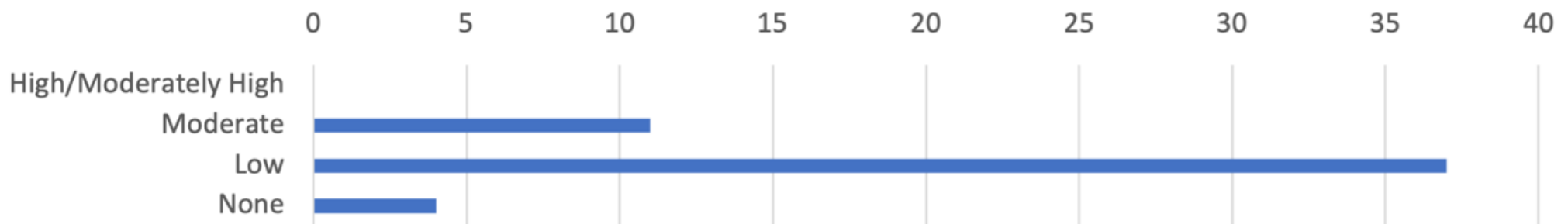
18 states have at least moderate state regulations on biosolids nutrient management. The remainder rely mostly on the nutrient management requirements in the federal Part 503 and/or have no state-level requirements.

Are states compiling biosolids data and making it available to the public?

Here is the NBDP's assessment of the accessibility of biosolids data from the states.



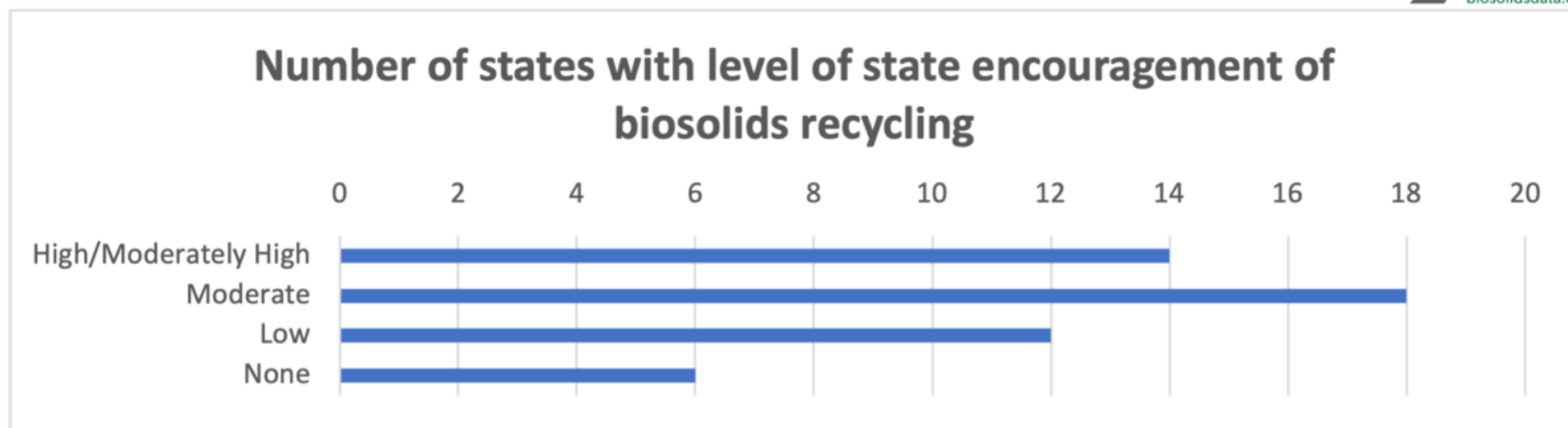
Number of states with level of accessibility of biosolids data



The large majority of states compile minimal biosolids-related data and/or provide minimal easy access to data.

Are states encouraging biosolids recycling?

Here is the NBDP's assessment of the levels of encouragement of biosolids recycling in the states.



32 states encourage biosolids recycling through various forms of policy, guidance, & implementation of biosolids requirements. The remaining states provide little or no encouragement of biosolids recycling.

Applying the Data

- Use the NBDP data to:
 - Assess capacity issues
 - Understand local and regional markets
 - Understand WRRF & biosolids program needs
 - Regional Planning
 - Supporting policy & regulation development
 - Develop recommendations for short-term and long-term actions



Dedication to beneficial use

Recycling biosolids benefits the environment, public health, & local economies. In responses to the WRRF survey, many biosolids professionals expressed their dedication to biosolids recycling:



“While it would be cheaper to go to a landfill, we have prided ourselves to have 100% of the biosolids to go to beneficial reuse. No biosolids have gone to the landfill.”

–City of Cookeville WWTP, Tennessee

“Beneficial use of biosolids as fertilizer and soil amendment product is a priority to our facility. It helps that is also the most cost effective and environmentally friendly option.

–WRRF in north central Utah

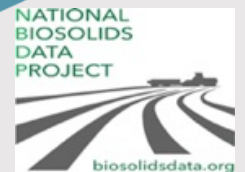
“Our farm partner and their property are considered a community asset that our governing body supports in many ways. Biosolids land application is a priority for the farm and the community in working to keep this farm financially viable and based in our community.”

–Village of Essex Junction, Vermont

QUIZ

The following slides provide audience interaction and encourage viewing of the NBDP website, where answers to these quiz questions can be found on the state pages.

For answers, see biosolidsdata.org.



QUIZ

1. Where do they produce the EQ biosolids named “Bloom?”

CHOICES

District of Columbia	South Dakota
Indiana	Georgia
California	Maine
Florida	Nevada
Connecticut	Kentucky

For answers, see biosolidsdata.org.



QUIZ

2. Which western state's 64,600 dry metric tons of solids went almost entirely (97%) to landfills in 2018?

CHOICES

District of Columbia	South Dakota
Indiana	Georgia
California	Maine
Florida	Nevada
Connecticut	Kentucky

For answers, see biosolidsdata.org.

QUIZ

3. Which Midwest state manages its ~200,000 dry U. S. tons of biosolids in equal parts landfill disposal, incineration, and land application?

CHOICES

District of Columbia	South Dakota
Indiana	Georgia
California	Maine
Florida	Nevada
Connecticut	Kentucky

For answers, see biosolidsdata.org.



QUIZ

4. Which state makes the most wastewater solids?

5. Which state makes the least?

CHOICES

District of Columbia	South Dakota
Indiana	Georgia
California	Maine
Florida	Nevada
Connecticut	Kentucky

For answers, see biosolidsdata.org.

QUIZ

6. Many states have limited landfill capacity, but this state leads the pack in WRRFs struggling to find places for their solids because landfills are limiting the wet materials they take in (because of slopes slumping and potential fires).

CHOICES

District of Columbia	South Dakota
Indiana	Georgia
California	Maine
Florida	Nevada
Connecticut	Kentucky

For answers, see biosolidsdata.org.

QUIZ

7. Which southern state imposed strict new regulations in 2021 that reduced a lot of land application because of concerns about phosphorus?

CHOICES

District of Columbia	South Dakota
Indiana	Georgia
California	Maine
Florida	Nevada
Connecticut	Kentucky

For answers, see biosolidsdata.org.

Thanks to these partners for funding support!



NACWA





Thanks to these partners for funding support!

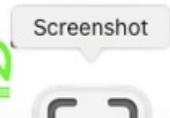


Screenshot

Thanks to these partners for funding support!



Metropolitan Water Reclamation District of Greater Chicago



Questions?



Janine Burke-Wells

[@nebiosolids.org](mailto:janine@nebiosolids.org)

603-323-7654



a National Biosolids Data Project presentation • June 24, 2022

A full set of slides (.ppt) is available for a fee at <https://www.biosolidsdata.org/data-downloads>.

Permission granted for use in accordance with [Data Use Policy](#).