



NATIONAL BIOSOLIDS SURVEY

2018 data
conducted 2020-2021
biosolidsdata.org

U.S. National Biosolids Data

Infrastructure & Wastewater

	2004 Data 8,776 (from NBDP state surveys), 16,824 (based on Clean Watershed Needs Survey (CWNS))	2018 Data 14,800 (from NBDP state surveys), 15,008 (Seiple et al., 2017, based on CWNS))	
Total Number of WRRFs (WWTPs):			
WRRF & Biosolids Infrastructure Totals			
Number of Separate Preparers (entities that further treat biosolids, making Class B or A):	186	200	-----
Total number of WRRFs sending to those Separate Preparers:	2300	1,500	-----
Number of operating sludge incinerators (total):	90+	100	-----
Fluidized bed:	28+	35+	-----
Multiple hearth:	42+	43+	-----
Number of Part 258 landfills accepting sewage sludge:	data not requested for 2004	insufficient data	-----
Number of WRRFs with industrial pre-treatment programs:	data not requested for 2004	insufficient data	-----
Number of WRRFs with sludge lagoons:	data not requested for 2004	insufficient data	-----
Wastewater Flow Totals			
Total national average daily wastewater flow (MGD):	data not requested for 2004	32,800	-----
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:	data not requested for 2004	insufficient data	-----
Number of WRRFs involved in those complaints:	data not requested for 2004	insufficient data	-----
Percent of population served by on-site systems (e.g. septic systems):	data not available for 2004; see notes, right	22%	-----

The number of WRRFs is the sum of the numbers reported for each state. Seiple et al. 2017 report a total of 15,008 based on U.S. EPA Clean Watershed Needs Survey (CWNS) data and other sources. • The number of separate preparers and number of WRRFs sending solids to them are estimates based on reports from 33 states; there are likely more. • Regarding the number of sewage sludge incinerators (SSIs): the data are approximate, because some states reported the numbers of WRRFs with SSIs and some reported the number of SSIs (e.g. many WRRFs have more than one SSI). However, the 2018 estimate is more precise than the 2004 number, which was a minimum estimate. The number of SSIs has actually decreased somewhat between 2004 and 2018. • The 22% of population served by on-site (septic) systems was derived from calculating the population served by on-site systems in each state (based on percentages provided by state experts for 42 of the 53 states and territories) and dividing that total by the total U.S. population (~330 million). For comparison, the U.S. Census Bureau reported that 24% of U.S. households relied on on-site septic systems in 1990, and U.S. EPA estimates that, in recent decades, of new homes being built, about 1/3 rely on on-site systems.

Biosolids Use and Disposal

UNITS:	Dry metric tons	Dry metric tons	2004 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 (WRRFs & Sep. Preparers) Included in State Reports and Going To...	Quantity of Biosolids Included in 2004 State-by-State Reports and Going To...	Number of Entities (WRRFs & Sep. Preparers) 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 WRRFs. Quantities are in the units (the form of measurement) indicated above.
Beneficial Use (applied to soils, not including ADC)	4,639	3,177,080	3,900	3,028,000	The 2018 quantity (tonnage) data are from a more robust compilation in the national "dashboard" spreadsheet. • The 2004 data have been converted to dry metric tons (dmt). • The total 2018 tonnage (5,823,000 dmt) includes the "other," which was solids used or disposed in 2018 but for which specific management was not known. (Includes 11,000 dmt for deep well injection in CA.) In contrast, the "long-term storage" solids reported for 2004 were not used or disposed of 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 not more accurate and could also be rounded to 1000s.
Disposal & Alternative Dispositions	3,166	2,945,633	3,100	2,733,000	
Other	1,149	381,586	1,500	62,000	
TOTAL	8,776	6,122,713	8,500	5,823,000	
Beneficial Use					
	Number of Entities in 2004 (WRRFs & Sep. Preparers) 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 (WRRFs & Sep. Preparers) 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 "dashboard" spreadsheet, except for the "long-term storage" tonnage, which is an estimate from this spreadsheet tally of states' 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 a 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 397 million acres. Thus, all beneficially used biosolids in 2018 were applied to less than 0.3% of U.S. croplands. 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. croplands.
Agricultural (EQ, Class A, & Class B)	3,999	2,376,472	3,000	2,301,571	
Forestland (EQ, Class A, & Class B)	28	23,992	30	12,607	
Reclamation (EQ, Class A, & Class B)	94	87,888	40	59,964	
Class A EQ Distribution (bagged or bulk, public distribution, or unsure where it went)	449	688,728	700	653,829	
Beneficial Use Subtotal	4,461	3,177,080	3,900	3,027,971	
Long-term storage	1,149	381,586	800	228,000	
Number of acres to which biosolids were applied:				1,056,000	
Disposal & Alternative Dispositions					
	Number of Entities in 2004 (WRRFs & Sep. Preparers) Included in State Reports With Disposal As Indicated...	Quantity of Biosolids Included in 2004 State-by-State Reports and Disposed of as Indicated...	Number of Entities (WRRFs & Sep. Preparers) Included in 2018 State Reports With Disposal As Indicated...	Quantity of Biosolids Included in 2018 State-by-State Reports and Disposed of as Indicated...	
Landfill (total)	2,600	1,835,322	2,600	1,718,843	
Burial	data not requested for 2004	data not requested for 2004	1,847	1,499,513	

Alternative daily cover (ADC), intermediate, or final cover	data not requested for 2004	data not requested for 2004	160	219,330
Surface Disposal	54	129,414	70	132,942
Incineration	512	980,897	400	881,433
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	2	11,000
Gasification	data not requested for 2004	data not requested for 2004	3	417
Pyrolysis	data not requested for 2004	data not requested for 2004	0	0
Disposal & Alternative Dispositions Subtotal	3,166	2,945,633	3,100	2,733,218
TOTAL	8,776	6,122,713	7,000	5,823,000

The numbers of entities going to different disposal alternatives in 2018 are estimates based on summing the numbers reported by state experts (compiled in the "raw data" in this spreadsheet). • The 2018 quantity (tonnage) data are from a more robust compilation in the national "dashboard" spreadsheet. • The 400 entities for incineration is an estimate of the total number of WRRFs that send solids to incineration either at their own SSI or at an SSI at another WRRF. • Deep well injection is practiced by 2 WRRFs in CA, including by Los Angeles. • In 2018, there were 3 biosolids gasification systems in operation in the U.S.: 2 in TN and 1 in CA.

Biosolids Quality Summary

	Number of Entities (WRRFs & Sep. Preparers) in 2004 Producing...	Quantity of Biosolids Reported in 2004 State-by-State Reports...	Number of Entities (WRRFs & Sep. Preparers) in 2018 Producing...	Quantity of Biosolids Reported in 2018 State-by-State Reports...	NOTE: For "number of entities," the total may not match because some entities go to more than one use or disposal.
Class A EQ	478	1,336,797	900	1,437,000	A trend confirmed by these data is the increase in production of Exceptional Quality (EQ) and other Class A biosolids over the past two decades. • The "Other" category includes wastewater solids that are not treated to Class B or Class A standards because they are disposed in landfills or incinerators. The tonnage of "Other" likely also includes some Class B and A biosolids for which no data were available.
Other Class A	12	52,297	300	128,000	
Class B	3,898	2,061,646	3,000	1,724,000	
Other (no data, etc.)	5,524	2,632,636	10,600	2,534,000	
TOTAL	9,912	6,083,376	14,800	5,823,000	

Biosolids Treatment Practices

	Estimated Number of WRRFs or Separate Preparers Using...	Estimated Quantity of Biosolids Produced Using...	Estimated Number of WRRFs or Separate Preparers Using...	Estimated Quantity of Biosolids Produced Using...	
Stabilization					For 2018, the numbers of WRRFs using each of the treatment technologies (see column D) are the sum of the numbers reported by about 1/2 of the states and territories. (The remaining ~1/2 of the states provided no data on treatment systems.) Thus, the numbers here are only useful for providing a sense of the proportional numbers of WRRFs using the various technologies. • Explanations for the tons of biosolids in the column labeled "Estimated Quantity of Biosolids Produced Using..." (column E) are as follows: for "Stabilization," NBDP has extrapolated the data provided by ~1/2 of the states to estimate total nationwide tonnages for each stabilization technology; for "Dewatering" and "Thickening," the tonnages are the sums of actual data provided by <1/2 of the states (n=22 for dewatering data and n=11 for thickening data) and are only useful for giving a sense of the proportional amounts of solids treated by the various technologies. • Data on bagged biosolids are based on estimates by state experts from ~13 states.
Aerobic Digestion (total)	2,200	77,095	2,000	702,000	
Class A (ATAD/Other)	data not requested for 2004	data not requested for 2004	50	insufficient data	
Class B	data not requested for 2004	data not requested for 2004	1,950	insufficient data	
Anaerobic digestion (AD) (total)	1,000	1,103,819	1,250	1,350,000	
Class A (e.g. thermophilic)	data not requested for 2004	data not requested for 2004	220	insufficient data	
Class B (mesophilic)	data not requested for 2004	data not requested for 2004	1,030	insufficient data	
WRRFs co-digesting (FOG, food, glycol, etc.)	data not requested for 2004	data not requested for 2004	30	insufficient data	
Biogas used (heating, electricity, fuel, etc./scf/year)	data not requested for 2004	data not requested for 2004	insufficient data	insufficient data	
Lime/Alkaline (total)	900	258,495	226	566,000	
Class A lime/alkaline	data not requested for 2004	data not requested for 2004	70	insufficient data	
Class B lime/alkaline	data not requested for 2004	data not requested for 2004	156	insufficient data	
Composting	200	427,197	270	1,836,000	
Thermal (e.g. heat drying, not incineration/gasificatn/pyrol)	60	101,584	100	1,011,000	
Gasification	data not requested for 2004	data not requested for 2004	3	417	
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	5	261,000	
Long-term (lagoons, reed beds, etc.)	500	87,979	insufficient data	1,202	
Oxidation ditch / extended aeration	data not requested for 2004	data not requested for 2004	insufficient data	insufficient data	
Other stabilization technology	20	4897.8	insufficient data	94,000	
Dewatering					
Belt Filter Press	650	376,405	540	329,000	
Plate & Frame Press	50	59,409	36	27,000	
Screw Press	10	3,084	50	9,000	
Centrifuge	50	798,160	140	194,000	
Vacuum Filter	20	3,809	1	1,000	
Drying beds (open-air)	400	344,660	370	55,000	
Solar drying (e.g. in greenhouse)	data not requested for 2004	data not requested for 2004	3	0	
Other dewatering technology	40	544.2	50	5,000	
Thickening					
Gravity thickener	data not requested for 2004	data not requested for 2004	190	134,166	
Gravity belt thickener (GBT)	data not requested for 2004	data not requested for 2004	108	72,924	
Centrifuge	data not requested for 2004	data not requested for 2004	19	58,530	
Dissolved air flotation (DAF)	data not requested for 2004	data not requested for 2004	37	59,408	
Other thickening technology	data not requested for 2004	data not requested for 2004	50	20,010	
Biosolids sold in bags (explain at right what size bags)	data not requested for 2004	data not requested for 2004	15	1,505	