Pets, Livestock, and Wildlife Implementation Strategies

E. coli bacteria are common inhabitants of the intestines of all warm-blooded animals, including mammals and birds. As such, the potential for bacteria loading in waterways from pets, livestock, wildlife, and unmanaged feral animals was an important consideration in the development of this I-Plan. Wildlife and feral hogs are naturally attracted to riparian corridors of streams and rivers. With direct access to the stream channel, the direct deposition of wildlife waste can be a concentrated source of bacteria loading to a water body. Fecal bacteria from wildlife are also deposited onto land surfaces, where it may be washed into nearby streams by rainfall runoff. Like wildlife, livestock can also be concentrated around riparian areas. In the Dallas-Fort Worth metropolitan area, there is little open space for the housing of livestock — with the notable exception of the floodplain. This close proximity to the Trinity River and major tributaries and the direct deposition of livestock waste as its own concentrated source cannot be ignored as a potential contributor to *E. coli* levels in the Project area.

For the sake of this I-Plan, pets are defined exclusively as cats and dogs. Table 29 details pet populations by impaired stream segment. With a cat and dog population well over a half million within the Project area, the probable contribution of their waste to *E. coli* levels makes them too important to ignore even with the difficulties in estimating actual loading levels.

Table 1. Dog and Cat Population by Impaired Segment

AU	Est. number of households	Estimated number of Dogs and Cats*	
		Dogs	Cats
0805_03	93,765	59,259	66,854
0805_04	94,475	59,709	67,361
0822A_02	5,602	3,540	3,994
0822B_01	11,673	7,377	8,323
0841_01	5,935	3,751	4,232
0841_02	35,089	22,176	25,018
0841B_01	32,344	20,441	23,061
0841C_01	1,410	891	1,006
0841E_01	321	203	229
0841F_01	9,454	5,521	6,032
0841G_01	2,823	1,784	2,013
0841H_01	18,254	11,537	13,015
0841J_01	3,941	2,490	2,810
0841K_01	22,422	13,094	14,305
0841L_01	25,612	16,187	18,261
0841M_01	10,425	6,589	7,433
0841N_01	3,342	1,952	2,132
0841R_01	32,278	20,399	23,014
0841T_01	16,437	10,388	11,719
0841U_01	7,508	4,745	5,353
0841V_01	1,850	1,081	1,180
0806E_01	55,857	32,463	35,464
TOTAL	**490,817**	**305,577**	**342,809**

*0805 segment information from 2011 TCEQ report, *Two Total Maximum Daily Loads for Indicator Bacteria in the Upper Trinity River, Dallas, Texas*; 0822 segment information from 2011 TCEQ report, *Two Total Maximum Daily Loads for Indicator Bacteria in Cottonwood Branch and Grapevine Creek*; and 0841 data from 2013 TCEQ report, *Thirteen Total Maximum Daily Loads for Indicator Bacteria in the Lower West Fork Trinity River Watershed* and 2016 TCEQ report, *Four Total Maximum Daily Loads for Indicator Bacteria in Cottonwood Creek, Fish Creek, Kirby Creek, and Crockett Branch Watersheds Upstream of Mountain Creek Lake; and 0806E segment information from 2019 TCEQ Report, One Total Maximum Daily Load for Indicator Bacteria in Sycamore Creek.*

Implementation Strategy 4.0: Feral hog management

According to the Texas Parks and Wildlife Department (TPWD), feral hogs are listed as a nuisance species in Texas, which means they can be taken anytime with no season or quotas. Feral hogs are domestic hogs that either escaped or were released for hunting purposes. Hogs have four continuously growing tusks (two on top, two on bottom) and their contact causes a continuous sharpening of the lower tusks — making them a formidable weapon. They have relatively poor eyesight but have keen senses of hearing and smell. Feral hogs are distributed throughout much of Texas, frequently sharing the same habitat as white-tailed deer. Populations in Texas are thought to be on the rise and that increase in population and distribution is due in part to intentional releases, improved habitat, increased wildlife management, and improved animal husbandry through disease eradication, limited natural predators,

and high reproductive potential. There appear to be very few inhibiting factors to curtail the feral hog's population growth and distribution although extreme arid conditions may impede it.

Feral hogs compete directly with livestock as well as game and nongame wildlife species for food. However, the main damage caused to livestock and wildlife is indirect destruction of habitat and agriculture commodities. Rooting and trampling activity for food can damage agricultural crops, fields, and livestock feeding and watering facilities. Critical to bacteria control efforts, feral hogs also destabilize wetland areas, springs, and creeks by excessive rooting and wallowing, and their waste contributes to bacteria loading (TPWD, 2003). Implementation strategies for feral hogs are summarized in Table 30.

4.0.1: Annual feral hog management workshop

With continuous effort, feral hogs can be managed. The Texas Wildlife Services, formerly the Texas Wildlife Damage Management Service, a division of the Texas AgriLife Extension Service, and TPWD are valuable resources for training, technical assistance, and direct control in wildlife damage management including feral hog populations. As resources allow, NCTCOG will take advantage of the services provided by the Texas Wildlife Services and TPWD by arranging one feral hog management workshop for stakeholders annually for five years beginning in 2014. If interest in workshops remains strong after five years, NCTCOG will continue to arrange workshops within the area covered by this I-Plan.

4.0.2: Feral hog management forum

With the intent of promoting coordinated control efforts, NCTCOG will facilitate a twice-yearly forum of local municipalities and other agencies focused on feral hog control and education efforts, evaluating BMPs, and discussing existing programs regionally and nationally.

4.0.3: Feral hog management program

With the widespread impact of feral hogs, their breeding success, and their ability to travel long distances using riparian corridors (TPWD, 2003), the Coordination Committee encourages all municipalities to adopt feral hog control programs and to communicate and cooperate on feral hog control and education efforts, including participation in the feral hog management forum.

4.0.4: Feral hog management funding opportunities

NCTCOG and stakeholders will seek funding opportunities, including grants and SEPs, for municipalities with financial need for a feral hog control program.

Table 2. Implementation Strategy 4.0 Summary — Feral hog management

Targeted Source(s)	Feral hogs
Estimated Potential Load Reduction	IS 4.0 – 4.0.4 may result in a 5% reduction in bacteria loading contributed by increasing numbers of feral hogs over 25 years

Technical and Financial Assistance Needed	Technical: existing resources such as feral hog management trainings offered by TPWD, Texas Wildlife Services, and others Financial: grant funding and existing program funding
Education Component	An annual training workshop will be offered to stakeholders A feral hog forum will be initiated for control effort coordination
Schedule of Implementation	As resources are available, the implementation of this activity will begin immediately and will continue in five-year increments pending evaluation
Interim, Measurable Milestone	One workshops per year for five years Number of feral hog forum meetings
Progress Indicators	Number of attendees at annual workshop Number of stakeholders reached Number of stakeholders participating in coordinated control efforts
Monitoring Component	NCTCOG will collect information regarding number of trainings and participants, and forum participation
Responsible Entity	Wildlife agencies will conduct feral hog management training Appropriate stakeholders will attend and participate in feral hog forum meetings and efforts NCTCOG will coordinate trainings and forum meetings and provide an annual report to Coordination Committee

Implementation Strategy 4.1: Ordinance evaluation for livestock waste management, stocking rates, and related measures

There is only one concentrated animal feeding operation (CAFO) within the Project area. Lone Star Park, a horse racing facility near the Lower West Fork Trinity River (Segment 0841_01), is not authorized to discharge wastewater and is not thought to be a contributor to *E. coli* levels in the Lower West Fork. Other livestock in the watershed are maintained on pasture or in small horse stables that do not meet the regulatory definition of a CAFO.

In Chapter 4E, Grazing Management of the 2003 *National Management Measures to Control Nonpoint Pollution from Agriculture* report (EPA 841-B-03-004), the impact of livestock waste is discussed, including that livestock generate microorganisms in waste deposits as they graze on pasture and rangelands and these wastes contain fecal bacteria in numbers on the order of $10^5 – 10^8$ organisms per gram of waste, or $10^9 – 10^{10}$ excreted per animal per day. In addition to such indicator organisms, livestock can also serve as an important reservoir of pathogens such as *E. coli* O157:H7. The extent of

manure and microorganism deposition on grazing land typically depends on livestock density or stocking rate.

Release of microbes from manure deposited on grazing land is influenced by time, temperature, moisture, and other variables. Enhanced survival of microorganisms in fecal deposits on grazing land has been documented and the bacterial pollution potential of fecal deposits on grazing land is significant. Research has shown that fecal coliforms may survive in soil only 13 days in summer and 20 days in winter, but that cow fecal deposits provide a protective medium that permit microorganisms to survive for more than a year. Runoff from grazed land can contain high numbers of indicator microorganisms — in one study, fecal coliform (FC) counts of $10^3 – 10^5$ organisms/100 mL in pasture runoff. Another study reported that fecal coliform in runoff from simulated grazing plots were always higher ($2.4 \times 10^5 – 1.8 \times 10^6$ FC/100 mL) than counts from the ungrazed control plots (1.5×10^3 FC/100 mL). It is worth noting, however, that microorganism counts in runoff from grazing land are typically several orders of magnitude lower than numbers from land where manure is deliberately applied (USEPA, 2003).

Ordinance requirements among the municipalities in the Project area vary greatly and few of the cities have livestock registration programs making it difficult to assess livestock numbers and stocking rates. This kind of information is important not only because of the frequent proximity of livestock to water bodies but also because of the potential for overstocking and the resulting inability of the land to properly allow for enough infiltration of bacteria-laden stormwater.

As summarized in Table 31, the Coordination Committee recommends that all municipal MS4s in the Project area with livestock define and identify properties, including small commercial horse stables, and estimate those livestock numbers to distinguish land use for non-point sources by 2028. Additionally, municipalities with livestock should evaluate their ordinances and if necessary, amend them to include provisions for management of livestock waste, including stocking rates, and other measures restricting bacteria loading by 2033.

Table 3. Implementation Strategy 4.1 Summary — Ordinance evaluation for livestock waste management, stocking rates, and related measures

Targeted Source(s)	Livestock
Estimated Potential Load Reduction	IS 4.1 may result in a 4% reduction over 25 years through changes that reduce direct and stormwater-related bacteria loads contributed by livestock
Technical and Financial Assistance Needed	Technical: some technical assistance regarding livestock may be needed to undertake this activity Financial: existing local and grant funding as available
Education Component	As resources are available, NCTCOG and the Pets, Livestock, and Wildlife technical subcommittee will develop educational materials for livestock owners and property owners housing livestock and provide information to municipalities on stocking rates and livestock waste management

Schedule of Implementation	As resources are available, the implementation of this activity will begin immediately and will continue for the entire implementation process
Interim, Measurable Milestone	Livestock defined and numbers estimated Number of ordinances amended
Progress Indicators	By 2028, municipalities will have evaluated land use, defined and estimated livestock numbers By 2033 ordinances will be evaluated and amended as necessary for proper management of livestock waste
Monitoring Component	NCTCOG will collect information regarding municipal activities
Responsible Entity	Municipalities will define livestock and estimate livestock numbers, evaluate ordinances with regards to livestock waste and amend as necessary NCTCOG and Stormwater technical subcommittee will develop or find educational materials for livestock owners etc., develop/alter and provide information on stocking rates and livestock waste management to municipalities NCTCOG will collect information on progress indicators and provide an annual report to the Coordination Committee

Implementation Strategy 4.2: Pet waste control measures

Most, if not all, municipalities in the Project area have some type of provisions concerning pet waste; however, some may be too broad or general to be applied to public education and/or enforcement. Pet waste can contribute to *E. coli* levels in impaired waterways and highlight the importance of control measures (USEPA, 2003). By 2033 all municipal MS4s within the bacteria-impacted watersheds are encouraged to have provisions for pet waste pickup within their respective ordinances and active enforcement and public education programs in place. Table 32 below details the control measure for pet waste.

Table 4. Implementation Strategy 4.2 Summary — Pet waste control measures

Targeted Source(s)	Pets
Estimated Potential Load Reduction	IS 4.2 may result in a 3% reduction over 25 years by assisting in reducing bacteria loads contributed by pets
Technical and Financial Assistance Needed	Technical: some technical assistance regarding pet waste may be needed to undertake this activity Financial: existing local and grant funding as available

Education Component	NCTCOG will utilize existing pet waste public education programs NCTCOG and the Stormwater technical subcommittee will develop or adapt educational materials on pet waste if needed
Schedule of Implementation	All municipalities are encouraged to have pet waste control measures within their ordinances by 2033
Interim, Measurable Milestone	Ordinances changed to include pet waste control Municipalities with active pet waste enforcement and education programs
Progress Indicators	The number of ordinances including pet waste control measures
Monitoring Component	NCTCOG will collect information regarding municipal activities
Responsible Entity	NCTCOG and Stormwater technical subcommittee will develop or modify educational materials on pet waste management NCTCOG will use and distribute existing pet waste education materials and report on progress indicators to the Coordination Committee Municipalities will include pet waste control provisions in their ordinances, have active enforcement/public education efforts, and report progress indicators to NCTCOG

Implementation Strategy 4.3: Avian management plan

Feeding of avian species in ponds and other waterways promotes higher avian populations than would exist without feeding (Abulreesh, 2004). Excess nutrients in ponds caused by such high numbers of avian and their droppings can result in water-quality problems including increased *E. coli* counts. All municipal MS4s within the bacteria-impaired waterways are encouraged to evaluate the need for an avian management plan, with a focus on measures to discourage avian feeding rather than population control measures. Table 33 expands on the details of a waterfowl management plan.

Table 5. Implementation Strategy 4.3 Summary —Avian management plan

Targeted Source(s)	Waterfowl
Estimated Potential Load Reduction	IS 4.3 may result in a 2% reduction over 25 years by reducing overloading of water bodies by avian populations, and thereby reducing bacteria loads contributed by waterfowl
Technical and Financial Assistance Needed	Technical: some technical assistance regarding avian may be needed to undertake this activity Financial: existing local and grant funding as available

Education Component	As resources allow, existing or new educational materials will be developed for municipalities to educate their citizens on feeding of avian.
Schedule of Implementation	As resources are available, the implementation of this activity will begin immediately and will continue for the entire implementation process
Interim, Measurable Milestone	MS4s will evaluate the need for avian management plans
Progress Indicators	Number of evaluations conducted by MS4s of the need for avian management plans Number of avian management plans or educational programs implemented Number of educational materials distributed
Monitoring Component	NCTCOG will provide a report to the Coordination Committee on progress indicators
Responsible Entity	MS4s will evaluate the need for an avian management plan, implement educational programs as needed, and report progress indicators to NCTCOG NCTCOG will collect information from MS4s and report progress to the Coordination Committee

Implementation Strategy 4.4: Model ordinance development

As detailed in Table 34, NCTCOG and stakeholders will, as resources allow, develop a model ordinance for inclusion in the BMP Library (see Implementation Strategy 8.0) which will include provisions for pet and livestock waste removal and stocking rates.

Table 6. Implementation Strategy 4.4 Summary — Model ordinance development

Targeted Source(s)	Pets and livestock
Estimated Potential Load Reduction	IS 4.4 may result in a 2% reduction over 25 years through the implementation of improved ordinances by MS4s that lead to a reduction in bacteria loading
Technical and Financial Assistance Needed	Technical: no technical assistance will be necessary Financial: grants and/or existing funding as appropriate
Education Component	Once model ordinance is developed, NCTCOG will refer stakeholders to the BMP Library

Schedule of Implementation	As resources are available, the implementation of this activity will begin immediately and NCTCOG and the Pets, Livestock, and Wildlife technical subcommittee will begin work on developing or adapting a model ordinance
Interim, Measurable Milestone	Ordinances evaluated for pet waste control and livestock waste control provisions
Progress Indicators	Model ordinance developed
Monitoring Component	NCTCOG will collect information on availability of model ordinance in BMP Library
Responsible Entity	NCTCOG and Stormwater technical subcommittee will develop or modify a model ordinance for pet waste control and livestock waste control NCTCOG place model ordinance in the BMP Library

Implementation Strategy 4.5: Pet waste collection stations and BMPs at parks

Increasing stormwater retention time over natural soils allows for greater infiltration of bacteria. In areas of parks with heavy use by dogs, horses, and other animals and the resulting potential for bacteria loading in nearby waterways, the use of BMPs can be particularly important. The Coordination Committee encourages the use of BMPs such as buffer strips, swales, and other methods to reduce bacteria loading from dog parks and other parks with concentrated animal presence to reduce bacteria loading from these sources. Furthermore, the Coordination Committee encourages all municipal MS4s within bacteria-impaired watersheds ensure adequate placement of pet waste collection stations in parks with the greatest potential to contribute to bacteria loading, such as those adjacent to waterways and parks with significant use by dogs, horses, or other animals. The details of implementation strategy 4.5 can be found in Table 35.

Table 7. Implementation Strategy 4.5 Summary — Pet waste collection stations and BMPs at parks

Targeted Source(s)	Pets and horses
Estimated Potential Load Reduction	IS 4.5 may result in a 4% reduction in bacteria loading from parks with substantial animal use over 25 years
Technical and Financial Assistance Needed	Technical: some technical assistance may be necessary regarding park BMPs and pet waste collection stations Financial: grants and/or existing funding as appropriate
Education Component	As resources are available, NCTCOG and the Stormwater technical subcommittee will develop or modify educational materials for park goers regarding pet waste collection and park BMPs

Schedule of Implementation	As resources are available, the implementation of this activity will begin immediately and NCTCOG and the Stormwater technical subcommittee will begin work on developing or adapting public education materials for park goers regarding pet waste and park BMPs MS4s with parks used by pets will use BMPs in parks to help reduce bacteria loading
Interim, Measurable Milestone	Park BMPs implemented Pet waste collection stations installed
Progress Indicators	Number of park BMPs implemented Number of pet waste collection stations installed
Monitoring Component	NCTCOG will collect information from MS4s regarding park BMPs and pet waste collection stations
Responsible Entity	MS4s with parks used by pets will implement BMPs and install pet waste collection stations as feasible, and report those measurements to NCTCOG NCTCOG will collect BMP and collection station data and report those findings to Coordination Committee

Implementation Strategy 4.6: Distribution of pet waste education materials

Doo the Right Thing is an existing public education program through the RSWMCC's Public Education Task Force. *Doo the Right Thing* helps MS4s participating in the RSWMP educate their citizens on issues such as the potential health risks from pet waste, the impact of pet waste on water quality, and tips for dealing with pet waste. There are also posters, flyers, pledge forms, bag holders, and other education items available for distribution through the cooperative purchase program. In addition to maximizing distribution of pet waste education materials to their respective populations as a whole, the Coordination Committee encourages municipalities with pet adoption and/or pet registration programs to include distribution of pet waste education materials, such as those from *Doo the Right Thing*, as part of the pet adoption or registration process. Table 36 further explains the distribution of pet waste education materials.

Table 8. Implementation Strategy 4.6 Summary — Distribution of pet waste education materials

Targeted Source(s)	Pet waste
Estimated Potential Load Reduction	IS 4.6 may result in a 2% reduction over 25 years through more responsible management and disposal of pet waste, thereby reducing pet waste available for transport to waterways

Technical and Financial Assistance Needed	Technical: no additional technical assistance is necessary Financial: grants and/or existing funding as appropriate
Education Component	Use existing pet waste education materials and distribute to general public When possible, include these educational materials with pet adoption and/or pet registration
Schedule of Implementation	As resources are available, the implementation of this activity will begin immediately and will continue for the entire implementation process
Interim, Measurable Milestone	Increase in ordering of Doo the Right Thing materials through RSWMP Cooperative Purchase
Progress Indicators	Number of education items distributed
Monitoring Component	NCTCOG will collect information on number of pet waste materials purchased
Responsible Entity	MS4s will distribute pet waste education materials to general public, using existing contact opportunities such as pet registrations and adoptions NCTCOG will collect pet waste education material purchase records and report to the Coordination Committee