Trap Check Resources

October 6-7, 2018 Meeting of the

Montana Trapping Advisory Committee

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PURPOSE OF THIS BINDER

The purpose of this binder is to ensure easy and equal access to materials regarding trap checks for all members of the Trapping Advisory Committee. Tabs 2 and 3 are copies of a letter to Montana Fish, Wildlife & Parks authored by NRDC. Tab 2 is an exact copy of the original letter. Tab 3 is a reader-friendly version of the same letter, with footnotes and signatures omitted.

Tabs 4—21 contain excerpts from several articles and other sources that are cited in the letter. These excerpts include the content that was used to inform the letter and are meant to facilitate and support discussion. Works are excerpted (rather than included in full) for ease of use and to minimize binder size. Complete versions of each article are available in a single, additional binder, which has also been provided for the October 6-7 meeting of the Trapping Advisory Committee. Complete versions of each article can also be made available to interested committee members upon request.

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July 15, 2018

Montana Fish, Wildlife & Parks
Wildlife Division
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Re: Proposed 2018-2019 Furbearer and Trapping Regulations, Seasons and Quotas

Dear Montana Fish, Wildlife & Parks:

The undersigned organizations and individuals submit these comments in support of a 24-hour or daily trap inspection requirement for all restraining traps (including foothold traps and foot snares) and kill traps (including Conibear traps and neck snares)[1] set for all species in the state of Montana. Such a requirement is needed for several reasons.

First, Montana is one of only three states in the country with no general trap check requirement. The other two are North Dakota and Alaska.[2] Every other state that allows recreational trapping, as well as all three Canadian provinces that border Montana, require that traps and snares be regularly inspected.

Second, daily trap check requirements are common. Thirty-six states have adopted 24-hour or daily trap inspection requirements for at least some types of traps or trapping situations.[3] These include western states like Washington, California, Arizona, New Mexico, and Colorado.

Third, numerous scientific studies indicate that 24-hour or daily trap inspections would help reduce the severity of injuries inflicted on captured animals.[4] Long restraint time is associated with

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[1] G. Iossa, C. D. Soulsbury, and S. Harris, "Mammal Trapping: A Review of Animal Welfare Standards of Killing and Restraining Traps," *Animal Welfare*, Vo. 16, no. 3 (Aug 2007), pp. 335-352; G. Proulx et al., "Humaneness and Selectivity of Killing Neck Snares Used to Capture Canids in Canada: A Review," *Canadian Wildlife Biology and Management*, Vol. 4, no. 1, pp. 55-65 (2015).
[2] See Appendix.
[3] Id.
[4] See, e.g., Andelt, W. F., R. L. Phillips, R. H. Schmidt, and R. B. Gill. 1999. Trapping furbearers: an overview of the biological and social issues surrounding a public policy controversy. Wildlife Society Bulletin 27(1):53-64; Butterworth, A. (2017). Marine mammal welfare: Human induced change in the marine environment and its impacts on marine mammal welfare. Cham, Switzerland: Springer, p. 553; Cattet, M., J. Boulanger, G. Stenhouse, R. A. Powell, and M. J. Renolds-Hogland, An Evaluation of Long-term Capture Effects in Ursids: Implication for Wildlife Welfare and Research, Journal of Mammalogy, 89(4):973-990 (2008); Halstead, T. D., K. S. Gruver, R. L. Phillips,

increased exertion, struggling, injury, dehydration, starvation, effects of exposure (such as hypothermia and (for nocturnal animals) sunlight[5]), and capture myopathy (physiological imbalances following extreme struggle and stress).[6]

Fourth, requiring that traps be checked each day would also reduce injury to, and unintentional mortality of, "non-target" species. Between 2010 and 2014, for example, traps and snares in Montana unintentionally captured, injured, or killed at least 89 mountain lions, 12 black bears, three grizzly bears,* four wolves, 21 bobcats, 31 river otters, four wolverines,* three lynx,* three fishers,* nine deer, one elk, one pronghorn antelope, 5 raptors,* and ten badgers, among other species.[7, 8] These are just the reported incidents. Requiring traps to be checked frequently would increase the chances that these species would be released alive and less seriously injured.

Fifth, wildlife professionals support daily trap inspections. The Association of Fish and Wildlife Agencies (AFWA) Trapper Education Manual urges trappers to "make a commitment to check your traps at least once every day" in order to reduce suffering, more quickly release non-target animals, and actually improve success (by, for example, reducing the chance of predation on an animal caught in a trap).[9] Likewise, in its online trapping course, AFWA treats daily trap checks as a cornerstone of ethical trapping practice, and consistently instructs trappers to perform them.[10] In addition, AFWA used daily trap checks to develop its Best Management Practices ("BMPs") for trapping in the U.S.[11] Montana Fish, Wildlife & Parks ("FWP") promotes these BMPs on its website.[12] The National Trappers Association recognizes the significance of AFWA as one of the "largest international organizations representing professional wildlife conservation employees and governmental wildlife agencies."[13]

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and R. E. Johnson. 1995. Using telemetry equipment for monitoring traps and snares. Proceedings of the Great Plains Wildlife Damage Control Workshop 12:121-123; Welfare Outcomes of Leg-Hold Trap Use in Victoria. (2008). Nocturnal Wildlife Research Pty Ltd., p. 76; Zuardo, T. (2017). How the United States Was Able to Dodge International Reforms Designed to Make Wildlife Trapping Less Cruel. Journal of International Wildlife Law & Policy, 20(1), 73-95. doi:10.1080/13880292.2017.1315278.

[5] Nocturnal species that are trapped in Montana include bobcats, raccoons, beavers, muskrat, mink, marten, wolverine, and swift fox. See Foresman, K. R. (2012). *Mammals of Montana* (2nd ed.). Missoula, MT: Mountain Press Pub.

[6] See, e.g., M. Cattet et al., "An Evaluation of Long-Term Capture Effects in Ursids: Implications for Wildlife Welfare and Research," *Journal of Mammalogy* 89, no. 4 (Aug 2008); Proulx et al.

[7] See https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/sa_reports/sa_pdrs (last visited July 15, 2018); Montana Fish, Wildlife & Parks, Incidental Captures in Montana 2009-2014 License Years (provided Jan. 2016; latest data available).

[8] Those species with an asterisk (*) following their name are currently designated as "species of concern" in Montana. From records provided by Montana Fish, Wildlife & Parks, it is not clear which raptors were captured; multiple raptor species are designated as species of concern in the state.

[9] See Association of Fish and Wildlife Agencies, Trapper Education Manual, p. 97 (2005).

[10] See Association of Fish and Wildlife Agencies, North American Basic Trapper Course, Introduction, available at https://conservationlearning.org/ (last visited July 15, 2018).

[11] See Association of Fish and Wildlife Agencies, "Best Management Practices for Trapping in the United States: Introduction," (2006), p. 4.

[12] See http://fwp.mt.gov/hunting/trapping/ (last visited July 14, 2018).

[13] See http://www.nationaltrappers.com/trappingfacts.html (last visited July 15, 2018).

Further, in its guidelines for the use of wild animals in research, the American Society of Mammalogists states that most traps should be checked at least once a day,[14] and restraining traps like snares and foothold traps must be checked "twice daily or more often depending upon target species and potential for capture of non-target species."[15] The American Veterinary Medical Association opposes the use of conventional foothold traps and states that traps should be checked "at least once every 24 hours."[16]

Finally, in 2017, FWP itself recommended a mandatory trap-check interval:

> FWP should have a maximum time allowed legally between trap checks as a means of dealing with the occasional instance of negligence. Such a regulation would allow enforcement to pursue clear cases of negligence and would likely encourage reduced trap check intervals for some who currently check at "too long of an interval."[17]

In sum, in order to minimize stress, struggling, exertion, injury, and unnecessary mortality to target and non-target species, and in order to improve enforcement and discourage negligent trap check intervals, we respectfully request that FWP adopt a regulation requiring that all restraining and kill traps and snares set for all species in Montana be visually inspected at least once each day or every 24 hours.

Thank you for considering this request.

Sincerely,

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[14] See Sikes, R.S., W. L. Gannon, and the Animal Care and Use Committee of the American Society of Mammalogists. 2011. Guidelines of the American Society of Mammalogists for the use of wild mammals in research, Journal of Mammalogy, 92(1):235-253, 244.

[15] Id. at 242.

[16] See https://www.avma.org/KB/Policies/Pages/Trapping-and-Steel-jawed-Leghold-Traps.aspx (last visited July 15, 2018).

[17] See Montana Fish, Wildlife & Parks, "Public Comment Summary for June 2017 Trapping Proposal" available at http://fwp.mt.gov/doingBusiness/insideFwp/commission/meetings/agenda.html?coversheet&topicId=41849575 (last visited July 14, 2018).

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Missoula, MT

Riann Lemler
Butte, MT

Robert Hilten
Columbus, MT

Joanna Dove
Helena, MT

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Megan Friend
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Claire Morgenstern
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Jesse Shayne
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Joseph, OR

Donald Molde
Reno, NV

Lisandre Lyon
Seal Beach, CA

Patricia Anderson
Dunedin, Otago
New Zealand

Pamela Alvesteffer
Fremont, MI

Brian M. Beckmann
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Sharon Brown
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Jennifer Edelen
Louisville, KY

Laura Fertig
Kanab, UT

Richard W. Firth
Mechanicsville, VA

Jeana Fox
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Prescott, AZ

Robert Goldman
Portland, ME

Sharon Guritz
Atlanta, GA

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Sheryl Hester
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Thora Gerry Hodge
Clarkdale, AZ

Tanya Kasper
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Margot Lowe
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Karin Mahuna
Colorado Springs, CO

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Kimberly McGuire
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Evi Meuris
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Steven Neill
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Susan Sorg
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Appendix A: *Trap Check Requirements in the United States*

Table 1: General Trap Check Intervals by State for Live Sets*

	INTERVAL:	BY STATUTE/REGULATION:
ALABAMA	24 hours[1]	ALA. CODE § 9-11-266
ALASKA	None	N/A
ARIZONA	Daily	ARIZ. ADMIN. CODE § 12-4-307(G)(1)
ARKANSAS	Daily	002-00-001 ARK. CODE R. §17.02
CALIFORNIA	Daily	CAL. CODE REGS. tit. 14, § 465.5(g)(2)
COLORADO	Daily[2]	COLO. CODE REGS. § 406-3 #302(B)(2)
CONNECTICUT	24 hours	CONN. GEN. STAT. § 26-72
DELAWARE	24 hours[3]	DEL. CODE tit. 7, § 705
FLORIDA	24 hours	FLA. ADMIN. CODE r. 68A-24.002(1)
GEORGIA	24 hours	GA. CODE § 27-3-63(a)(3)
HAWAII	No furbearer trapping	HAW. ADMIN. CODE § 13-123-22
IDAHO	72 hours[4]	IDAHO ADMIN. CODE § 13.01.16.200.01
ILLINOIS	Daily	520 ILL. COMP. STAT. 5/2.33a
INDIANA	24 hours	IND. CODE § 14-22-6-4
IOWA	24 hours	IOWA CODE § 481A.92
KANSAS	Daily	KAN. ADMIN. REGS. § 115-6-5(c)(13)
KENTUCKY	24 hours	KY. REV. STAT. § 150.410(2)
LOUISIANA	Daily	LA. REV. STAT. § 56:260(A)
MAINE	Daily	ME. REV. STAT. tit. 12, § 12255(1)
MARYLAND	Daily[5]	MD. CODE REGS. 08.03.06.03(E)
MASSACHUSETTS	Daily	321 MASS. CODE REGS. 3.02(e)(11)
MICHIGAN	Daily[6]	Mich. Wildlife Conservation Order § 3.600(12)(a)
MINNESOTA	Daily	MINN. R. 6234.2200
MISSISSIPPI	36 hours	MISS. CODE ANN. § 49-7-13(4)(d)
MISSOURI	Daily	MO. CODE REGS. tit. 3, § 10-8.510(2)
MONTANA	None	N/A
NEBRASKA	Daily	163 NEB. ADMIN. CODE § 4-001.03A1
NEVADA	96 hours[7]	NEV. ADMIN. CODE § 503.570(3)
NEW HAMPSHIRE	Daily	N.H. REV. STAT. § 210:13
NEW JERSEY	24 hours	N.J. ADMIN. CODE § 7:25-5.12(i)
NEW MEXICO	Daily	N.M. CODE R. § 19.32.2.11(A)
NEW YORK	24 hours[8]	N.Y. COMP. CODES R. & REGS. tit. 6, § 6.3(a)(3)
NORTH CAROLINA	Daily	15A N.C. ADMIN. CODE 10B.0110
NORTH DAKOTA	None	N/A
OHIO	Daily	OHIO ADMIN. CODE 1501:31-15-09(G)
OKLAHOMA	24 hours	OKLA. STAT. tit. 29, §5-502(C)
OREGON	48 hours[9]	OR. REV. STAT. § 498.172(1)
PENNSYLVANIA	36 hours	34 PA. CONS. STAT. § 2361(a)(10)

RHODE ISLAND	24 hours	20 R.I. GEN. LAWS § 20-16-9
SOUTH CAROLINA	Daily	S.C. Code § 50-11-2440
SOUTH DAKOTA	72 hours[10]	S.D. Admin. R. 41:08:02:03
TENNESSEE	36 hours	Tenn. Fish and Wildlife Comm. Proclamation 18-05, § III (9)
TEXAS	36 hours	31 TEX. ADMIN. CODE § 65.375(c)(2)(E)
UTAH	48 hours	UTAH ADMIN. CODE r. 657-11-9(12)
VERMONT	Daily	Vt. Admin. Code 16-4-137:4.1
VIRGINIA	Daily	4 VA. ADMIN. CODE § 15-40-195
WASHINGTON	24 hours	WASH. ADMIN. CODE § 220-417-030(4)(c)
WEST VIRGINIA	Daily	W. VA. CODE R. § 58-53-3.3
WISCONSIN	Daily	WIS. ADMIN. CODE NR § 10.13(2)
WYOMING	72 hours[11]	040-0001-4 WYO. CODE R. § 9(a)

* "Live sets" are traps or snares intended to capture the animal alive.

Table 2: General Trap Check Intervals by State for Kill Sets**

	INTERVAL:	BY STATUTE/REGULATION:
ALABAMA	24 hours[1]	ALA. CODE § 9-11-266
ALASKA	None	N/A
ARIZONA	Daily	ARIZ. ADMIN. CODE § 12-4-307(G)(1)
ARKANSAS	72 hours	002-00-001 ARK. CODE R. §17.02
CALIFORNIA	Daily	CAL. CODE REGS. tit. 14, § 465.5(g)(2)
COLORADO	Daily[2]	COLO. CODE REGS. § 406-3 #302(B)(2)
CONNECTICUT	24 hours	CONN. GEN. STAT. § 26-72
DELAWARE	24 hours[3]	DEL. CODE tit. 7, § 705
FLORIDA	24 hours[12]	FLA. ADMIN. CODE r. 68A-24.002(1)
GEORGIA	24 hours	GA. CODE § 27-3-63(a)(3)
HAWAII	No furbearer trapping	HAW. ADMIN. CODE § 13-123-22
IDAHO	72 hours[4]	IDAHO ADMIN. CODE § 13.01.16.200.01
ILLINOIS	Daily	520 ILL. COMP. STAT. 5/2.33a
INDIANA	24 hours	IND. CODE § 14-22-6-4
IOWA	24 hours[13]	IOWA CODE § 481A.92
KANSAS	Daily	KAN. ADMIN. REGS. § 115-6-5(c)(13)
KENTUCKY	24 hours	KY. REV. STAT. § 150.410(2)
LOUISIANA	Daily	LA. REV. STAT. § 56:260
MAINE	Daily[14]	ME. REV. STAT. tit. 12, § 12255(1)
MARYLAND	Daily[5]	MD. CODE REGS. 08.03.06.03(E)
MASSACHUSETTS	Daily	321 MASS. CODE REGS. 3.02(e)(11)
MICHIGAN	None	Mich. Wildlife Conservation Order § 3.600(12)(a)
MINNESOTA	Every three days	MINN. R. 6234.2200
MISSISSIPPI	36 hours	MISS. CODE ANN. § 49-7-13(4)(d)
MISSOURI	48 hours	MO. CODE REGS. tit. 3, § 10-8.510(2)
MONTANA	None	N/A
NEBRASKA	Every two days	163 NEB. ADMIN. CODE § 4-001.03A1
NEVADA	96 hours[7]	NEV. ADMIN. CODE § 503.152
NEW HAMPSHIRE	Daily[15]	N.H. REV. STAT. § 210:13
NEW JERSEY	24 hours	N.J. ADMIN. CODE § 7:25-5.12(i)
NEW MEXICO	Daily	N.M. CODE R. § 19.32.2.11(A)
NEW YORK	24 hours[8]	N.Y. COMP. CODES R. & REGS. tit. 6, § 6.3(a)(3)
NORTH CAROLINA	Daily[16]	15A N.C. ADMIN. CODE 10B.0110
NORTH DAKOTA	None	N/A
OHIO	Daily	OHIO ADMIN. CODE 1501:31-15-09(G)
OKLAHOMA	24 hours	OKLA. STAT. tit. 29, §5-502(C)
OREGON	48 hours[9]	OR. REV. STAT. § 498.172
PENNSYLVANIA	36 hours	34 PA. CONS. STAT. § 2361(a)(10)
RHODE ISLAND	24 hours	20 R.I. GEN. LAWS § 20-16-9

SOUTH CAROLINA	Daily[17]	S.C. CODE § 50-11-2440
SOUTH DAKOTA	72 hours[10]	S.D. ADMIN. R. 41:08:02:03
TENNESSEE	72 hours	Tenn. Fish and Wildlife Comm. Proclamation 18-05, § III (9)
TEXAS	36 hours	31 TEX. ADMIN. CODE § 65.375(c)(2)(E)
UTAH	96 hours[18]	UTAH ADMIN. CODE R. 657-11-9(12)(a)–(c)
VERMONT	Daily[13]	Vt. Admin. Code 16-4-137:4.1
VIRGINIA	Daily[19]	4 VA. ADMIN. CODE § 15-40-195
WASHINGTON	72 hours	WASH. ADMIN. CODE § 220-417-030(4)(c)
WEST VIRGINIA	Daily	W. VA. CODE R. § 58-53-3.3
WISCONSIN	Daily	WIS. ADMIN. CODE NR § 10.13(3)(a)
WYOMING	Weekly[11]	040-0001-4 WYO. CODE R. § 9(a)

****** "Kill sets" are traps or snares intended to kill the animal instantly or by asphyxiation or drowning.

Table 3: Survey of Trap Check Requirements in the United States

The number of states which have adopted:

24-hour or daily check requirements for at least some traps	**36**
48-hour (or more frequent) check requirements for at least some traps	**44**
72-hour (or more frequent) check requirements for at least some traps	**47**
24-hour or daily check requirements for *all* traps	**16**
48-hour (or more frequent) check requirements for *all* traps	**25**
72-hour (or more frequent) check requirements for *all* traps	**30**
check requirements for *all* traps	**33**
***no* general check requirements**	**3**

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[1] 72 hours for water sets.
[2] Most sets are constitutionally prohibited in Colorado. See COLO. CONST. art. XVIII, § 12b. An exemption from the constitutional prohibition and the normal trap check requirements is granted to persons on their own land primarily used for commercial agriculture, to protect that agriculture. See id.; COLO. REV. STAT. § 33-6-207.
[3] Muskrat traps exempted.
[4] "Unprotected rodents" exempted; in effect, all rodents except for beavers. *Compare* IDAHO ADMIN. CODE § 13.01.16.010.01 *with id.* § 13.01.16.010.03 (definitions of "furbearing animals" and "unprotected wildlife").
[5] Every two days for water sets.
[6] Except: 1) in Michigan's Upper Peninsula ("Zone 1"), where the interval is 48 hours; and 2) for licensed trappers using multi-animal cage sets, for whom there is no requirement. *See* Mich. Wildlife Conservation Order § 1.2(21) – (23) for the definitions of Zones 1, 2, and 3.
[7] Generally, some units require an interval of every other day for some sets.
[8] 48 hours for some wildlife management units ("WMU"), 48 hours for some sets in other WMUs.
[9] Predator trapping exempted, though must still be checked "on a regular basis."
[10] 96 hours if west of the Missouri River.
[11] Snares and quick-kill body traps exempted. These must be checked once each calendar week except for the first week in which the trap was set.
[12] Only snares allowed.
[13] Drowning sets exempted.
[14] Drowning sets every three days, or every five days in unincorporated/unorganized areas; sets under ice set for beaver or muskrat exempted.
[15] Except sets for beaver under ice, then every three days.
[16] Except for drowning set Conibears, then 72 hours.
[17] 48 hours for drowning sets.
[18] Except for lethal snares without a relaxing lock or stop set to an immovable object, which have a 96 hour requirement.
[19] Drowning set Conibears exempted.

3

Re: Proposed 2018-2019 Furbearer and Trapping Regulations, Seasons and Quotas

[COPY of LETTER without Footnotes or Signatures]

Dear Montana Fish, Wildlife & Parks:

The undersigned organizations and individuals submit these comments in support of a 24-hour or daily trap inspection requirement for all restraining traps (including foothold traps and foot snares) and kill traps (including Conibear traps and neck snares) set for all species in the state of Montana. Such a requirement is needed for several reasons.

First, Montana is one of only three states in the country with no general trap check requirement. The other two are North Dakota and Alaska. Every other state that allows recreational trapping, as well as all three Canadian provinces that border Montana, require that traps and snares be regularly inspected.

Second, daily trap check requirements are common. Thirty-six states have adopted 24-hour or daily trap inspection requirements for at least some types of traps or trapping situations. These include western states like Washington, California, Arizona, New Mexico, and Colorado.

Third, numerous scientific studies indicate that 24-hour or daily trap inspections would help reduce the severity of injuries inflicted on captured animals. Long restraint time is associated with increased exertion, struggling, injury, dehydration, starvation, effects of exposure (such as hypothermia and (for nocturnal animals) sunlight), and capture myopathy (physiological imbalances following extreme struggle and stress).

Fourth, requiring that traps be checked each day would also reduce injury to, and unintentional mortality of, “non-target” species. Between 2010 and 2014, for example, traps and snares in Montana unintentionally captured, injured, or killed at least 89 mountain lions, 12 black bears, three grizzly bears, four wolves, 21 bobcats, 31 river otters, four wolverines, three lynx, three fishers, nine deer, one elk, one pronghorn antelope, 5 raptors, and ten badgers, among other species. These are just the reported incidents. Requiring traps to be checked frequently would increase the chances that these species would be released alive and less seriously injured.

Fifth, wildlife professionals support daily trap inspections. The Association of Fish and Wildlife Agencies (AFWA) Trapper Education Manual urges trappers to “make a commitment to check your traps at least once every day” in order to reduce suffering, more quickly release non-target animals, and actually improve success (by, for example, reducing the chance of predation on an animal caught in a trap). Likewise, in its online trapping course, AFWA treats daily trap checks as a cornerstone of ethical trapping practice, and consistently instructs trappers to perform them. In addition, AFWA used daily trap checks to develop its Best Management Practices (“BMPs”) for trapping in the U.S. Montana Fish, Wildlife & Parks (“FWP”) promotes these BMPs on its website. The National Trappers Association recognizes the significance of AFWA as one of the "largest international organizations representing professional wildlife conservation employees and governmental wildlife agencies."

Further, in its guidelines for the use of wild animals in research, the American Society of Mammologists states that most traps should be checked at least once a day, and restraining traps like snares and foothold traps must be checked "twice daily or more often depending upon target species and potential for capture of non-target species." The American Veterinary Medical Association opposes the use of conventional foothold traps and states that traps should be checked "at least once every 24 hours."

Finally, in 2017, FWP itself recommended a mandatory trap-check interval:

> FWP should have a maximum time allowed legally between trap checks as a means of dealing with the occasional instance of negligence. Such a regulation would allow enforcement to pursue clear cases of negligence and would likely encourage reduced trap check intervals for some who currently check at "too long of an interval."

In sum, in order to minimize stress, struggling, exertion, injury, and unnecessary mortality to target and non-target species, and in order to improve enforcement and discourage negligent trap check intervals, we respectfully request that FWP adopt a regulation requiring that all restraining and kill traps and snares set for all species in Montana be visually inspected at least once each day or every 24 hours.

Thank you for considering this request. Sincerely,

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Mammal trapping: a review of animal welfare standards of killing and restraining traps

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Abstract

Millions of wild mammals are trapped annually for fur, pest control and wildlife management. Ensuring the welfare of trapped individuals can only be achieved by trapping methods that meet accepted standards of animal welfare. At the international level, the assessment of mechanical properties of killing and restraining traps is set out in two documents published by the International Organization for Standardization (ISO). Few traps currently in use have been tested according to the ISO standards and, in addition, new traps have been designed and old traps modified since the publication of the standards. In this paper we review trapping methods used in Europe and North America to see whether they meet the ISO standards and examine ways to improve the welfare performance of traps. In addition, international legislation is assessed to determine whether this ensures a sufficient level of welfare for trapped animals. Finally, trapping practices used in academic research are reviewed. We conclude that many of the practices commonly used to trap mammals cannot be considered humane. Current legislation fails to ensure an acceptable level of welfare for a large number of captured animals. New welfare standards for trapping wild mammals need to be established so that in future a minimum level of welfare is guaranteed for all trapped individuals.

Keywords: *animal welfare, international legislation, ISO standards, mammals, trapping standards, trap types*

Introduction

Historically, mammals were trapped mainly for fur and meat, but in recent times trapping has also been used as a management tool to resolve human-wildlife conflicts, for wildlife research and for conservation purposes. Worldwide, tens of millions of mammals each year are trapped legally. In the USA alone, up to two million muskrats (*Ondatra zibethicus*) are trapped every year (Fox 2004a). Additionally, an unknown number of animals are trapped illegally and, moreover, for every target animal captured, a varying number of non-target animals are injured or killed.

There are two basic types of traps: killing traps are used on land or underwater and render an animal unconscious within a certain time prior to death, whereas restraining traps hold the individual until contact is made by the trapper. The level of welfare of trapped animals (hereafter welfare performance) varies according to the type of trap. For instance, leg-hold traps are banned in 80 countries (Fox 2004a), including the European Union (The Council of European Communities 1991), because of their impacts on animal welfare.

Opposition of animal welfare groups in Europe and North America to trapping for fur culminated in the first effort by the International Organization for Standardization (ISO) to define humane international standards for killing and restraining traps (Harrop 2000; Princen 2004). However, no consensus could be reached on key thresholds for animal welfare standards, eg time to unconsciousness for animals trapped in killing traps, or levels of injuries for animals captured in restraining traps. Despite this, two documents were produced by the ISO to provide an agreed process for testing trap performance (safety and capture efficiency) and killing effectiveness for killing traps (ISO 10990-4 1999), and trap performance and trauma levels for physical injuries caused by restraining traps (ISO 10990-5 1999). Although the ISO standards do not offer any definition of acceptable standards of animal welfare, they are an initial step towards ensuring and improving welfare of wild mammals (Harrop 2000). The results collated from the tests as set by the ISO can, in fact, be interpreted in terms of the impact on animal welfare and the level of impact on animal welfare can, in turn, be used to make a decision on whether a trap falls below or above a threshold of acceptable standards of animal welfare. When the killing trap standards were published, the technical committee drafting the standards recommended a review of killing methods after five years so that all technical advancements could be incorporated. Similarly, for restraining traps it was recognised that physical injury represents only one component of welfare, and that the lack of data on other components such as behaviour, physiology, immunology and molecular biology prevented their use in welfare assessments. The technical committee advocated, therefore, that in future all these components of animal welfare should be integrated to provide a more comprehensive measure of welfare. Thus, Against Cruel Sports 2005). Even when neck snares are set and utilised correctly, they commonly catch non-target species and these can have high mortality (see later section) (Phillips 1996; Chadwick *et al* 1997; Defra 2005). Modification of neck snares may increase target specificity and reduce capture of non-target species (Pruss *et al* 2002; Luengos Vidal *et al* 2003), but overall the lack of data on the use of snares makes it difficult to assess their welfare impact.

In comparison to neck snares, the effectiveness and welfare performance of leg-hold snares is more commonly reported in the scientific literature (Table 4). In general, leg-hold snares appear to have an acceptable effect on welfare, with little target species mortality (Table 4). However, the same cannot be said for non-target species, which may experience high mortality (see later section). One further problem arises from foot swelling; several studies highlight that most individuals have a swollen foot caused by the noose, yet do not classify these as serious (Logan *et al* 1999; Frank *et al* 2003). Since snares may cause subsequent pressure necrosis, and even temporary limping may have a negative impact on an individual, further work is needed to examine the long-term welfare impact of leg-hold snares.

Leg-hold traps are considered inhumane and banned within the EU and 80 countries worldwide (Fox 2004a); nonetheless, they are a common capture device in North America and Canada. Across the literature, the majority of studies show a significant percentage of trapped individuals suffering major injuries (Table 5). If the criterion used is that 80% of individuals have nothing more than minor injuries (Anonymous 1998a), it is clear that both padded and unpadded leg-hold traps fail in this respect. Comparative studies have shown that padded leg-hold traps cause fewer injuries than unpadded leg-hold traps, but at the same time different studies on the same species have found contrasting welfare performance results (Table 5). For example, welfare performance of leg-hold traps for red foxes has been assessed extensively in different locations around the world, yet red foxes have very different bodyweights in different locations. Since smaller body size may increase the levels of injuries sustained using the same leg-hold traps (Seddon *et al* 1999), location differences of trap tests may confound results (International Association of Fish and Wildlife Agencies [IAFWA] 2003). In addition, the many different kinds of leg-hold traps (padded, unpadded, off-set jaws, double jaws, various sizes, different numbers of springs) and contrasting methods of assessing injuries make true comparisons difficult (Engeman *et al* 1997). What is clear is that 28/38 studies on leg-hold traps (Table 5) fall outside currently accepted standards of welfare (eg Proulx 1999a; Powell & Proulx 2003). Physiological studies demonstrate that they are more stressful than other capture techniques (Kreeger *et al* 1990; White *et al* 1991; Cross *et al* 1999; Warburton *et al* 1999), can have poor capture specificity (Table 6), and can reduce long-term survivorship of released individuals (Seddon *et al* 1999). Leg-hold traps are clearly not the most humane capture technique, yet where legal, for example in many states in the USA, they are widely used for a range of species (Fox & Papouchis 2004b).

Box and cage traps are one of the most widely used trapping techniques. Animals captured in these traps appear to undergo fewer traumas than those captured in snares and leg-hold traps (Table 4) (Powell & Proulx 2003). Significantly, if checked regularly and used correctly, mortality rates approach zero (Table 4). Wounds appear to be less severe, with most injuries confined to skin abrasions and broken teeth, often reduced by improved trap design and reduced mesh size (Short *et al* 2002; Powell & Proulx 2003). Box traps can capture a range of species, but unlike other trap methods, non-target species are typically released unharmed, the only distress experienced generally being that of restraint (Table 4). On the other hand, for large species, box traps can be bulky to transport and not practical to use in remote areas.

To date, there have been few comparative studies examining the physiological response to snares and box traps, other than a study comparing darting and leg-hold snares when capturing free-ranging brown bears (*Ursus arctos*) (Cattet *et al* 2003). Most studies compare physiological responses between leg-hold traps and box traps. The majority show that box traps are less stressful than leg-hold traps. Box traps caused an increase in cortisol compared to untrapped individuals (White *et al* 1991), but this was lower than individuals caught in leg-hold traps (Kreeger *et al* 1990; White *et al* 1991; Cross *et al* 1999; Warburton *et al* 1999). Significantly this was not related to injuries and therefore pain (Warburton *et al* 1999). Both box traps and leg-hold traps caused an increase in body temperature, heart rate and some blood metabolites, associated with increased activity, but box traps showed lower values than leg-hold traps, indicating lower physical activity when trapped (White *et al* 1991; Warburton *et al* 1999). Thus, box traps seem the most favourable option because the number of injuries is lowest and physiologically box traps appear to be the least stressful.

Trap selectivity

An important side-effect of both killing and restraining traps is selectivity, usually measured as the number of individuals of the target species caught relative to the number of non-target animals. It is evident from Table 6 that selectivity varies widely with trap type. However, whilst with killing traps all or the majority of non-target individuals captured are killed, restraining traps vary in mortality rates from 0% in box traps to 17% in leg-hold snares (Logan *et al* 1999; Potočnik *et al* 2002). It has long been recognised that non-target captures can be very high in comparison to target captures (eg it has been noted previously that the number of non-target to target animals can vary from 0-18.1) depending on trapping device used, season, bait and the way in which the trap is set in the field (Novak 1987; Proulx *et al* 1993). The capture of non-target individuals can also pose a serious threat to species of conservation concern. For instance, studies on museum specimens and necropsies of golden eagle (*Aquila chrysaeotos*), bald eagle (*Haliaeetus* *leucocephalus*) and Iberian lynx (*Lynx pardinus*) showed 42, 14 and 64% respectively died as a result of trapping or because of injuries caused by trapping (Bortolotti 1984; García-Perea 2000). However, not all mortality is immediately apparent at the time of the capture. For example, post-traumatic stress of capture can cause subsequent cardiac myopathy in ungulates (Putman 1995); moreover, post-release pressure necrosis may affect non-target species captured in snares (Stocker 2005). Guidelines to avoid capture of non-target species are available from organisations such as the British Association for Shooting and Conservation (2002), Defra (2005) and IAFWA (2006).

Making killing and restraining traps more humane

The development of higher welfare performance of traps should be a priority. Recently, much research has been devoted to testing the animal welfare impacts (reviews in Powell & Proulx 2003; Warburton & O'Connor 2004) and efficiency of killing traps (Pawlina & Proulx 1999), and integrating ethics and animal welfare in trapping research (IAFWA 1997; Broom 1999; Powell & Proulx 2003; Fox & Papouchis 2004a). In contrast, much less effort has been devoted to excluding non-target species from killing traps (Short & Reynolds 2001; Reynolds *et al* 2004).

Most of the killing traps currently in use fall below accepted standards of welfare (see next section on the Agreement), or may be effective when tested in compounds and ineffective in the field (Powell & Proulx 2003; Fox & Papouchis 2004b; Warburton & O'Connor 2004). Technical improvements may improve efficiency of some killing traps (Proulx & Barrett 1993a; Proulx *et al* 1995; Warburton & Hall 1995; Warburton *et al* 2000). For instance, improving strike precision of spring traps to target the neck and avoid back strikes can reduce the impact force needed to kill quickly (Nutman *et al* 1998; Warburton *et al* 2002). Increasing strike power is of concern for user safety but both strike precision and mechanical advances can avoid the use of increased power. Rotating-jaw traps can be further enhanced by offsetting the trap jaws (Zelin *et al* 1983) without the need to increase power. Some traps are quicker and more efficient killing devices than others. A trap designed to kill by shutting off the blood supply to the brain (a neck-hold trap) rather than one that aims to suffocate the animal by clamping its back (such as body-catch traps), will kill more quickly and more effectively (Proulx & Barrett 1991; Phillips 1996), although this may depend on the species (Copeland *et al* 1995). However, the trapping community seems to be resistant to the adoption of new devices and old and illegal methods are still widely used across the globe (Powell & Proulx 2003; Dronova & Shestakov 2005). An understanding of the biology of the target species, and extensive trapper training, are therefore essential to increase trap efficiency and improve animal welfare (Powell & Proulx 2003).

Many studies report slight species-specific modifications that can enhance the welfare of restraining traps. To reduce teeth breakage, box traps can be constructed from natural materials (Copeland *et al* 1995), mesh size or air hole size can be reduced (Arthur 1988; Powell & Proulx 2003), or box bars (a bar placed at the entrance of the trap to prevent biting of the door) can be added (Woodroffe *et al* 2005). For skin abrasions, smooth material can be used to construct traps or smooth coatings added to abrasive materials (Woodroffe *et al* 2005). Longer periods of time spent in the trap are often associated with greater exertion and more serious injuries (Powell & Proulx 2003). Most European countries and some North American states require traps (both killing and restraining) to be checked daily (although this may mean circa 36 hours, if traps are checked at dawn and then at dusk the following day [FACE 1998; Fox & Papouchis 2004a]). This is a minimum standard; reducing the time in traps by either checking more frequently (Proulx *et al* 1993) or monitoring traps with electronic devices can reduce the number of serious injuries (Kaczensky *et al* 2002; Potočnik *et al* 2002; Larkin *et al* 2003). The closure or tying open of traps during adverse weather conditions can reduce freezing damage or hypothermia in colder climes (de Vos & Gunther 1952). Welfare performance may also be improved in both neck and leg-hold snares. Increasing the diameter of the cable can reduce laceration injuries (Garrett 1999). The addition of swivels gives a struggling animal more flexibility and makes it more difficult to entangle or twist the snare (eg Nellis 1968; Logan *et al* 1999). Adding a breakaway snare lock, snare stops and pan tension devices can both minimise capture of non-target species, and ensure that stronger non-target species can escape from the snare (Garrett 1999). Altering the breaking tension of the cable itself can also minimise capture of some non-target species (Fisher & Twitchell 2003). A plastic coating around the wire noose can reduce injuries (Englund 1982). Careful site selection can prevent individuals becoming entangled in surrounding vegetation, and thus injured (Logan *et al* 1999). Some studies have shown that tranquillisers attached to snares can also reduce injuries (Garrett 1999; Pruss *et al* 2002; Marks *et al* 2004). Perhaps the greatest advancement to snare welfare would be better training for users and prosecution of those deliberately setting snares illegally. In future, new remote-controlled teleinjection methods (ie a blowgun remotely monitored and triggered up to 400 m away, shooting anaesthetised darts), which are being developed to catch large mammals with minimum stress and high selectivity, could be extremely useful for research and conservation purposes (Ryser *et al* 2005).

International legislation on mammal trapping

The ISO standards for killing and restraining traps were drafted by representatives of countries with an interest in trapping standards, members of the trapping community and animal welfare organisations (Harrop 1998, 2000). Since no agreement could be reached on either time to the onset of unconsciousness for killing traps or the use of non-physiological indicators of distress, which were perceived as two measures to assess humaneness (Harrop 1998, 2000), the European Union signed two international documents: the Agreement on International Humane Trapping

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Wildlife Management Technique — Review

Humaneness and Selectivity of Killing Neck Snares Used to Capture Canids in Canada: A Review

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Abstract

Although killing neck snares are used on traplines in Canada to capture gray wolves (*Canis lupus*), coyotes (*C. latrans*), and red foxes (*Vulpes vulpes*), they are not subject to trap performance criteria set out in the Agreement on International Humane Trapping Standards (AIHTS). This paper reviews scientific information related to the humaneness and selectivity of killing neck snares used to capture canids. All past studies demonstrated that manual and power killing neck snares were inadequate to consistently and quickly render canids unconscious. Furthermore, killing neck snares are non-selective, and impact seriously on the welfare of non-target animals. We recommend that the AIHTS be modified to allow only killing neck snares that kill quickly and consistently, and in the absence of such snares, to phase-out all killing snares for which efficient and more humane alternatives exist.

Key Words: *Canis latrans*, *Canis lupus*, Coyote, Gray Wolf, Humaneness, Killing Neck Snares, Red Fox, Standards, Trapping, *Vulpes vulpes*.

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of the snared animals that die and go undetected or unreported by people. Non-target captures included a wolverine (*Gulo gulo*) and a Canada lynx (*Lynx canadensis*), which are designated species at risk in Quebec (Fortin *et al.* 2005) and Nova Scotia (Nova Scotia Lynx Recovery Team 2006), respectively.

DISCUSSION

Currently available manual and power killing neck snares do not meet the AIHTS' humaneness standards (although these standards do not apply to snares), or Proulx and Barrett's (1994) standard. The work conducted by FPCHT (1981) and Proulx and Barrett (1990) confirmed the original concerns of some wildlife biologists (e.g., Guthery and Beasom 1978) about the cruelty of killing neck snares, and it gives credibility to the recurrent reports of moribund, snared wild and domestic animals rescued by the public (e.g., Perkel 2004; McShane 2014). Neck killing snares with one-way locking tabs were made illegal in the United Kingdom in 1981 (Wildlife and Countryside Act 1981). Killing snares are not used to catch any of the 11 AIHTS species found in the European Union (Talling and Inglis 2009). They are, however, still being used in some US states (Association of Fish and Wildlife Agencies Furbearer Conservation Technical Work Group 2009) and Russia (Talling and Inglis 2009).

The poor performance of manual and power killing neck snares at killing canids was demonstrated in scientific studies where state-of-the-art equipment and set procedures were employed. On traplines, however, many trappers see little or no value in improved locks and swivels (Figure 4) because their snares catch the target animals anyway, albeit in an inhumane manner. Also, trappers are not legally required to update their equipment. In some provinces, e.g., Saskatchewan, killing snares must be visited within a certain period of time, i.e., 48-72 h depending on the proximity from urban areas. In British Columbia, killing snares must be checked at least once every 14 days. In Alberta, there are no mandated checking times for snares. Consequently, snared animals can die slowly from their injuries, but also from exposure, exhaustion, dehydration, or starvation.

The ISO standards are the result of compromises between participating governments and agencies, and they may not be stringent due to a lack of will among some participants to either pursue further technological development or implement state-of-the-art technology (G. Proulx, personal observations at ISO meetings in Brussels, Belgium). Nonetheless, killing neck snares impact significantly on the welfare of captured animals, in a manner similar to that of steel leghold traps, which have been judged unacceptable at the international level (Proulx and Barrett 1989). It is therefore difficult to understand how killing neck snares became an exception in AIHTS's standards,

Figure 4. Basic manual killing neck snare set on a canid trail in northwestern Saskatchewan, February 2009. Note the absence of all possible improvements (e.g., locking tab, lock with compression spring, and swivel) (Photos: Gilbert Proulx).

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Trapping furbearers: an overview of the biological and social issues surrounding a public policy controversy

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The foothold trap is an important and traditional wildlife management tool (Boggess et al. 1990). Foothold traps comprised about 61% of the traps owned by trappers in the United States during 1992 (International Association of Fish and Wildlife Agencies Fur Resources Committee 1993). An estimated 300,000 licensed trappers harvested $121 million of fur in the United States during 1987 (International Association of Fish and Wildlife Agencies Fur Resources Committee 1993), which resulted in a total economic impact of $810.8 million (Southwick Associates, Arlington, Va., unpublished report, 1993). In Canada, about 51,000 trappers (N. Jotham, Canadian Wildlife Service, Ottawa, Ont., personal communication) harvested $26 million of fur (Statistics Canada 1996) during 1994–95. Many trappers, especially aboriginals in Canada, use furbearers for food (Todd and Boggess 1987). Of 61 North American jurisdictions, 80% referred nuisance furbearer complaints to trappers (Williams and McKegg 1987), and about 63% of trappers have been contacted to trap problem animals (International Association of Fish and Wildlife Agencies Fur Resources Committee 1993). Foothold traps have been used extensively by the U.S. Department of Agriculture's Wildlife Services program, accounting for 9% of 89,213 coyotes (*Canis latrans*) taken in the United States during 1995 (M. Mendoza, U. S. Department of Agriculture, APHIS, Wildlife Services, Riverdale, Md., personal communication), usually to resolve livestock depredation complaints. Foothold traps also have been used to remove coyotes, red foxes (*Vulpes vulpes*), and other predators to enhance survival of endangered San Joaquin kit foxes (*V. macrotis*; Cypher and Scrivner 1992), California least terns (*Sterna antillarum*; Butchko 1990), and waterfowl (Anthony et al. 1991, Lokemoen and Woodward 1993), as well as to capture endangered species such as gray wolves (*C. lupus*) and red wolves (*C. rufus*) for research and relocation. Additionally, foothold traps are a valuable method for capturing furbearers for research purposes.

Despite these apparent wildlife management benefits, trapping has been controversial at times during this century (Feldman 1996). Numerous attempts, at the local, state, and national levels, have been made to ban trapping; however, most have failed (Gentile 1987). Recent ballot initiatives to ban or limit trapping in Arizona (1994), Colorado (1996), Massachusetts

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Key words: animal welfare, *Canis latrans*, Colorado, coyote, foothold traps, furbearers, human dimensions, humaneness, injury, selectivity, wildlife damage

We believe reduced foot injuries sustained by coyotes and other animals captured in padded, compared to unpadded, traps is attributable to the padded jaws rather than the weaker springs on an earlier version of Soft Catch traps. Coyotes captured in Number 3 Soft Catch® traps, modified with stronger or additional coil springs (Figure 1) or in the larger Number 31/2 E-Z Grip® trap, sustained significantly fewer or similar foot injuries compared to coyotes captured in Soft Catch traps with standard and weaker coil springs (Tables 1, 2; Linhart et al. 1988, Gruver et al. 1996, Phillips et al. 1996). However, many animal welfare and animal rights organizations oppose padded traps (Stevens 1992) because foot, leg, and tooth injuries are not completely eliminated and even padded traps may be painful.

Trap check intervals and injuries

Opponents of trapping express concerns about lack of food and water and the stress endured by animals in traps. Boggess and Henderson (1981) and the Fur Institute of Canada (1989) recommended that all live-holding devices set on land should be checked daily. Using smaller traps (Novak 1987, Saunders et al. 1988, Warburton 1992) and daily or almost daily (1.4 days), early-morning trap checks (Novak 1987, Saunders et al. 1988, Proulx et al. 1994) have reduced injuries to trapped animals. In the United States during 1995, 33 states required that land-set traps must be checked every 24 hours or daily, but trap-check intervals were unlimited in 4 states (International Association of Fish and Wildlife Agencies Fur Resources Technical Subcommittee 1995).

Humaneness and capture efficiency

Foothold traps and trapping techniques developed to be more humane or selective should be comparable in capture efficiency (i.e., number of animals caught/unit of effort) to standard traps if they are to be acceptable to trappers (Novak 1987, Naylor and Novak 1994). However, even if more humane traps are not as efficient, trappers may have to use them to satisfy public concerns about the humane treatment of animals (Proulx and Barrett 1989). An early model of the Soft Catch trap had lower rates of capturing coyotes (Linhart et al. 1986, 1988; Linscombe and Wright 1988), bobcats (*Lynx rufus*), and red foxes (Linscombe and Wright 1988) than standard traps, but capture rates for red foxes were similar in another study (Tullar 1984). Newer and improved Number 3 Victor Soft-Catch® traps, when properly set, were as efficient as unpadded traps in capturing coyotes (Table 2; Skinner and Todd 1990, Linhart and Dasch 1992, Phillips et al. 1992, Phillips and Mullis 1996).

During wet conditions, Soft Catch traps may be less efficient than steel foothold traps for capturing red foxes (Kern et al. 1994), but Phillips and Mullis (1996) reported that the Number 3 Soft Catch® trap was as effective as unpadded traps for capturing coyotes under a variety of operational trapping conditions. The latest version of Soft Catch traps recently (1997) has been manufactured with stronger springs (C. E. Tully, Woodstream Corporation, Lititz, Pa., personal communication), which may increase capture efficiency during wet conditions (Houben et al. 1993); additional springs also may increase efficiency (Gruver et al. 1996). Efficiency of padded traps improved as trappers gained experience in using them (Skinner and Todd 1990).

Capture selectivity

Trap selectivity depends not only on the mechanical attributes of a trap but also on where and how

Table 2. Mean and median injury scores and capture rates for 8 coyote restraining devices during Denver Wildlife Research Center studies.

Trap type	Test states[a]	n[a]	Injury Score Mean	Injury Score Median	Capture rate (%)
Sterling MJ600®[b]	Calif., Tex., Id.	68	103.3	80.0	94
No. 3 Northwoods® laminated[b]	Calif., Tex., Id.	59	79.3	80.0	95
Victor 3NM®[c]	Tex.	33	66.3	60.0	95
Heimbrock Special[c]	Calif., Tex.	30	80.5	80.0	94
No. 3 Soft Catch® standard[d]	Calif.	53	43.5	15.0	95
No. 3 Soft Catch® modified[d]	Calif.	60	26.2	15.0	97
No. 31/2 E-Z Grip®[b]	Calif., Tex., Colo.	65	29.0	10.0	88
Belisle foot snare[c]	Tex.	30	19.7	10.0	64

[a] Test states, test dates, and sample sizes for data on injury scores.

[b] From Phillips et al. (1996), and R. L. Phillips (Unpublished data).

[c] From R. L. Phillips (Unpublished data).

[d] From Gruver et al. (1996), and R. L. Phillips (Unpublished data). No. 3 Soft Catch® standard=No. 3 Soft Catch® trap with standard factory coil springs and a clamping force of 2.1 kg/cm^2. No. 3 Soft Catch® modified=No. 3 Soft Catch® trap with 4 coil springs and a clamping force of 3.6 kg/cm^2.

the trap is set, factors influenced by the knowledge and skill of a trapper. Properly set traps can effectively capture specific depredating animals (Gipson 1975, Andelt and Gipson 1979) and permit release of non-target animals.

Novak (1987) summarized >25 studies reporting 0 to >2 non-target animals captured/target animal. Trap selectivity for large species, such as coyotes, can be increased significantly by attaching a pan tension device (Figure 1), which increases the weight (generally 1.4–1.8 kg for coyote traps) required to fire the trap, thus excluding small animals (Turkowski et al. 1984, Butchko 1990, Phillips et al. 1992, Phillips and Gruver 1996). Traps modified with pan tension devices excluded 92–100% (Turkowski et al. 1984) and 97% of 826 (Phillips and Gruver 1996) small non-target animals, whereas unmodified traps excluded only 6% (Turkowski et al. 1984). Other methods that may reduce capture rates of non-target animals include setting traps >8 m from carcasses (Hein and Andelt 1994), using appropriate and selective baits and lures (Andelt and Woolley 1996), covering baits in dirt-hole sets, setting traps away from residences and hiking trails, and not setting traps when the probability of capturing non-targets is high. Disadvantages of padded traps and pan-tension devices include higher purchase prices, the cost of replacing standard traps, the possible costs of modifying some new padded traps by attaching pan tension devices, the occasional need to replace worn or chewed rubber pads, and the additional training required to use these new traps effectively.

Public opinion and trapping

The public-at-large has limited knowledge of trapping (Behavior Research Center, Inc., Phoenix, Ariz., unpublished report, 1993; Duda and Young 1994). Only 22-42% of survey respondents indicated they supported trapping (Missouri Department of Conservation 1992; Behavior Research Center, Inc., Phoenix, Ariz., unpublished report, 1993; Duda and Young 1994; Fulton et al. 1995). This lack of support is underscored by a 1994 ballot initiative in Arizona that banned use of most traps for most purposes on public lands by a margin of 59 to 41%; a 1996 ballot initiative in Colorado that banned foothold traps, body-gripping traps, and snares (with a few exceptions) by a margin of 52 to 48%; and 1996 and 1998 ballot initiatives in Massachusetts and California that banned most traps for most purposes by margins of 64 to 36%, and 57.5 to 42.5%, respectively.

The public seems concerned primarily about humane treatment of animals (avoidance of pain and suffering), secondarily about specificity (extent to which only target animals are captured), and least concerned about the cost of control (and presumably trapping) methods (Arthur 1981). Trapping is perceived to cause more pain and suffering than other methods and is judged one of the least acceptable methods to control coyotes (Arthur 1981). In general, the public has negative attitudes toward traps and considers them inhumane (Kellert 1981; Galloway Vigil and Associates 1986; Behavior Research Center, Inc., Phoenix, Ariz., unpublished report, 1993; Reiter et al. 1995).

Public approval of trapping also depends on the reason for trapping. In 2 surveys—one in 1995 in Colorado (Fulton et al. 1995) and one in 1994 in Illinois (Duda and Young 1994)—only 9 and 15% of respondents, respectively, approved of trapping for recreation, whereas 13 and 27%, respectively, approved of trapping to obtain money. However, 69% of respondents in Colorado and 71% in Illinois approved of trapping to protect livestock and property, and 87% of the Colorado respondents supported trapping to prevent the spread of disease.

More than 80% of Colorado adults surveyed indicated that wildlife and trapping laws should be rewritten to ensure that pain and suffering to wildlife were minimized (Fulton et al. 1995). Those respondents (33%) who opposed trapping in Illinois indicated that they would be more likely to find trapping acceptable if daily trap checks and limited trap sizes were legal requirements (they are, in fact, in Illinois), and if certain types of traps were prohibited to ensure that trapping was conducted as humanely as possible given current technology (Duda and Young 1994). Thirty-one percent of the respondents indicated that knowing that seasons were structured in the fall and winter to avoid capture or abandonment of young would make them more inclined to find trapping acceptable. Given these results, we believe the public would be more likely to support padded-jaw traps and other improvements to traps which reduce injuries.

Ballot initiatives are frequently used by small groups exploiting mass media to affect voting and to usurp agency or legislative decisions on wildlife management issues (Minnis 1998). In 1996, the public voted on wildlife policy issues in Alaska, California, Colorado, Idaho, Massachusetts, Michigan, Oregon, and Washington. These policy issues were debated in forums rich in propaganda but often lacking informed debate. For examthreatened and endangered species, and emphasize publicly acceptable reasons for trapping, such as minimizing economic damage (see also Behavior Research Center, Inc., Phoenix, Ariz., unpublished report, 1993; Duda and Young 1994; Fulton et al. 1995). A public communication program that clearly explained trapping policies and their rationale would be helpful (Fulton et al. 1995). The overall goal of a public education program should be to obtain informed consent for trapping, not to convince the public that animals feel good in traps.

Public beliefs and attitudes toward trapping appear rooted in values about wildlife welfare, wildlife rights, and wildlife uses (Fulton et al. 1995). People's basic value and belief structures are far more intractable than most wildlife professionals want to believe (Fulton et al. 1996). The most promising way to educate a limited portion of the public about the complexities of public policy issues appears to be through public involvement processes that assign significant power to the participants (Stout et al. 1996). When members of the public directly engage one another in the resolution of public issues of mutual concern, knowledge of issues, tolerance for competing values and viewpoints, flexibility, adaptability, and creative problem solving are all enhanced (Barber 1984, Dryzek 1990, Yankelovich 1991, Manning 1993).

Economic factors

The IAFWA Fur Resources Committee (1993) reported that trappers across the United States spent an average of $1,126 each for traps, lures, travel expenses, other trap-related equipment, and major equipment purchases in the 1991-92 season. Number 1 1/2 and Number 3 Soft Catch traps cost about $110 and $150/dozen, respectively, approximately 50% more than standard steel foothold traps. Costs might be reduced by manufacturing padded jaws that could be used to retrofit existing standard traps and by phasing in padded traps over a period of time.

Managing the controversy

Wildlife managers are entrusted by the public to be stewards of publicly owned wildlife resources (Kania and Conover 1991). Regardless of funding sources, professional wildlife managers dealing with public resources should understand and represent many of the myriad values of the public or at least conduct activities that are within the public's informed consent. Traditionally, wildlife managers have focused on biological aspects of wildlife management, but now they are paying closer attention to the sociological and political aspects. Peterson and Manfredo (1993) contend that social science must be elevated to a higher level of emphasis within wildlife management to meet the challenges of the 21st century and beyond. Wildlife managers must establish and maintain impeccable professional standards to treat the people's wildlife humanely and ethically to avoid the loss of public credibility and trust (Schmidt 1992).

Wildlife managers should continue to endorse traps and trapping as a wildlife management activity. In doing so, they should be concerned with: (1) developing, scientifically evaluating, manufacturing, and implementing more humane and selective traps; (2) adopting minimum trap-check intervals that reduce animal injuries; (3) setting harvest seasons to avoid periods when females have dependent young; and (4) focusing on the need to trap where public tolerance and acceptance are high, such as instances of safeguarding public health and safety, managing wildlife damage, and protecting endangered wildlife species and habitats. We need to develop and implement standards nationally and internationally to demonstrate dramatically and publicly the commitment of the wildlife profession to ethical and humane practices consistent with widespread public wildlife values. Lastly, we need better forums for concerned members of the public, the trapping community, and wildlife managers to debate and resolve concerns over trapping.

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Chapter 30
Animal Welfare Issues Pertaining to the Trapping of Otters for Research, Conservation, and Fur

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30.1 Introduction

Legal trapping of otters is conducted for research (e.g., to equip individual animals with radio transmitters) and applied conservation (e.g., to obtain individuals for reintroduction projects) and for utilitarian purposes (i.e., the fur industry for some species). Until relatively recently, standards defining the most appropriate traps in relation to animal welfare for wildlife caught for utilitarian purposes (wildlife species killed for fur have become generically referred to as furbearers, a term that will be used hereafter) were poorly established. Trapping was usually subject to regulations imposed by individual wildlife management jurisdictions [e.g., state and provincial wildlife agencies in the United States of America (USA) and Canada, respectively]. Canada, Russia, the European Union (EU), and USA are involved in collaborative, ongoing efforts to develop and implement standards for what ostensibly constitutes "humane trapping." The motivation for developing trapping standards seems largely a response by Canada, Russia, and the USA (the three top wild fur-producing countries; Animal Legal and Historical Center 2010) to overcome

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A study in coastal Alaska used No. 11 double-jaw longspring traps set on land (anchored with trap chains ≤70 cm in length) to live-capture 30 river otters (Blundell et al. 1999). This project used a trauma scale developed by Olsen et al. (1996) and Jotham and Phillips (1994) to score injuries to the teeth and appendages [scores for an individual could range from 0 (no injuries) to 100 (death)] but did not provide details of specific injuries contributing to scoring or the number of individuals acquiring injuries to the teeth and/or appendages. Traps were monitored a minimum of two to three times daily—a transmitter was attached to traps, and this was activated when traps were sprung. The scoring system and number of daily trap checks present a challenge for meaningful comparison with Serfass et al. (1996), who used different metrics to quantify injuries, and traps were checked once daily. More frequent trap checks may reduce frequency and extent of injuries by minimizing time an animal is restrained by a trap. Five (17%) of the river otters captured in No. 11 double-jaw traps by Blundell et al. (1999) attained serious injuries to appendages, whereas only one (3%) of those caught in padded traps by Serfass et al. (1996) would have been scored as having a serious injury. Injuries to the teeth considered serious were low in Blundell et al. (1999) and also likely to be low for Serfass et al. (1996), but actual comparison is not possible because of the different scoring systems followed by the respective projects. Melquist and Hornocker (1979) captured nine river otters in leghold traps [five captures in No. 2 coil spring traps and four captures in No. 3 jump traps (no longer manufactured to our knowledge)]. Injuries to river otters caught in No. 2 coil spring traps were described as minor (no details provided), but escape rates were reportedly high. Two of the river otters (both juveniles) caught in No. 3 jump traps sustained broken hind limbs (the bones broken were not reported).

30.6.2 Hancock Trap

The Hancock trap was originally designed for live-trapping American beavers. Northcott and Slade (1976) and Melquist and Hornocker (1979) described important modifications necessary for the trap to be suitable for river otters (i.e., to prevent escape). Two further modifications were made by Serfass (1984): the first enabled the trap to lay flat for concealment when set in shallow water (as manufactured the movable side of the trap is at an angle to the fixed side), and the second involved covering the fixed side of the trap (comprised wires spanning opposing sides of the trap frame to form a rigid 5 × 10-cm grid) with vinyl coated 2.5 × 2.5-cm welded wire fencing (Fig. 30.2a, b). When constrained, river otters often vigorously attempt to escape by scratching or biting to breach any perceived weak areas in a cage, cage-type trap, or other confinement, potentially causing injury to fore-paws and teeth. The spacing of wires on the fixed side of the trap created a grid comprised of openings likely large enough to become the focus of escape efforts by river otters (the head of most river otters will fit through a 5 × 10-cm opening), which was overcome by the second modification. Also, when set flat in shallow

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AN EVALUATION OF LONG-TERM CAPTURE EFFECTS IN URSIDS: IMPLICATIONS FOR WILDLIFE WELFARE AND RESEARCH

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The need to capture wild animals for conservation, research, and management is well justified, but long-term effects of capture and handling remain unclear. We analyzed standard types of data collected from 127 grizzly bears (*Ursus arctos*) captured 239 times in western Alberta, Canada, 1999–2005, and 213 American black bears (*U. americanus*) captured 363 times in southwestern North Carolina, 1981–2002, to determine if we could detect long-term effects of capture and handling, that is, effects persisting ≥1 month. We measured blood serum levels of aspartate aminotransferase (AST), creatine kinase (CK), and myoglobin to assess muscle injury in association with different methods of capture. Serum concentrations of AST and CK were above normal in a higher proportion of captures by leghold snare (64% of 119 grizzly bear captures and 66% of 165 black bear captures) than capture by helicopter darting (18% of 87 grizzly bear captures) or by barrel trap (14% of 7 grizzly bear captures and 29% of 7 black bear captures). Extreme AST values (>5 times upper reference limit) in 7 (6%) grizzly bears and 29 (18%) black bears captured by leghold snare were consistent with the occurrence of exertional (capture) myopathy. We calculated daily movement rates for 91 radiocollared grizzly bears and 128 radiocollared black bears to determine if our activities affected their mobility during a 100-day period after capture. In both species, movement rates decreased below mean normal rate immediately after capture (grizzly bears: $\bar{X} = 57\%$ of normal, 95% confidence interval = 45–74%; black bears: 77%, 64–88%) and then returned to normal in 3–6 weeks (grizzly bears: 28 days, 20–37 days; black bears: 36 days, 19–53 days). We examined the effect of repeated captures on age-related changes in body condition of 127 grizzly bears and 207 black bears and found in both species that age-specific body condition of bears captured ≥2 times (42 grizzly bears and 98 black bears) tended to be poorer than that of bears captured once only (85 grizzly bears and 109 black bears), with the magnitude of effect directly proportional to number of times captured and the effect more evident with age. Importantly, the condition of bears did not affect their probability of capture or recapture. These findings challenge persons engaged in wildlife capture to examine their capture procedures and research results carefully. Significant capture-related effects may go undetected, providing a false sense of the welfare of released animals. Further, failure to recognize and account for long-term effects of capture and handling on research results can potentially lead to erroneous interpretations.

Key words: American black bear, body condition, exertional myopathy, grizzly bear, long-term capture effects, movement rates, muscle injury, ursids, *Ursus americanus*, *Ursus arctos*

Information gathered from wild animals is required for wildlife research, conservation, and management. Although much can be learned by indirect techniques, such as collecting fecal samples to determine hormone status (Foley et al. 2001; Millspaugh et al. 2001) or collecting hair for DNA analysis (Beier et al. 2005; Boulanger et al. 2004), some information is collected only by capturing animals, for example, age determination, morphometric measurements, or serum biochemistry (Garshelis 2006; Powell and Proulx 2003). Capture of wild animals has potential to cause injury and to change

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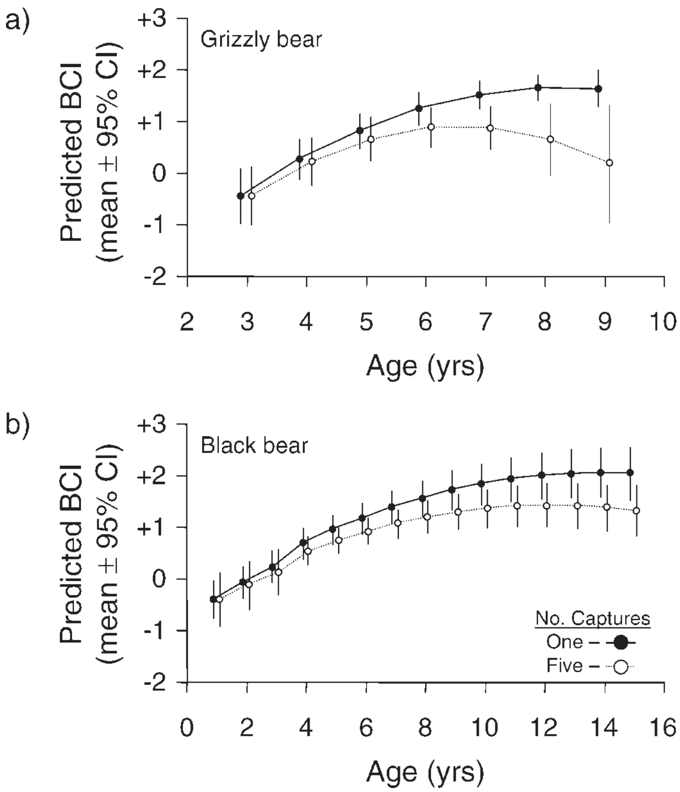

Fig. 5.—The relationship between body condition index (BCI) of a bear and its age as a function of number of times it was captured (once or 5 times) over the course of its lifetime predicted from the most-supported model for each species in Table 3. The analyses are based on capture records and BCI values for 130 grizzly bears captured 241 times and 207 black bears captured 299 times. The plots are standardized for a) male grizzly bears captured for the Foothills Model Forest Grizzly Bear Research Project in western Alberta, Canada (1999–2005), and b) male American black bears captured for the Pisgah Bear Sanctuary Black Bear Research Project in North Carolina (1981–2002). Although the age range for black bears (1–14 years) corresponds with the range of ages measured in captured male black bears, the age range for grizzly bears has been truncated at 9 years so that the total time interval of 6 years corresponds to the duration of sampling for this project, that is, 1999–2005. Ideally, we should have shown predicted curves for all levels of multiple captures (2–10) encountered in this study but this would have caused confusion and obscured any distinction with the curve for predicted BCI of bears "captured once only." We chose instead to show predicted curves for bears captured 5 times because this level was approximately midrange for number of captures per individual grizzly bear (2–8) and black bear (2–10). However, because capture effect is directly proportional to number of times captured, one can interpolate that curves for capture levels from 2 to 4 fall between predicted curves shown in the figure and curves for capture levels > 5 fall below the curve for "captured 5 times."

Discussion

We conducted a retrospective study using standard types of data (serum biochemistry, radiotelemetry, capture–recapture, and body condition) collected in many conservation-oriented studies involving carnivores. Our goal was to evaluate whether long-term (≥1 month) effects of capture and handling were detectable and, if so, to identify possible implications this could have for the welfare of released animals and the interpretation of research results. Our analysis of data collected from 2 independent studies involving 2 species of bears, in geographically distinct areas, suggest that capture and handling affected study animals for a much longer duration than has been recognized generally. Specifically, we found evidence that: capture caused significant muscle injury in some bears, especially when captured by leghold snare; movement rates of many bears were affected for weeks after capture; and body condition of bears was negatively affected by capture, an effect directly proportional to the number of times a bear was captured and more evident with age.

Capture-related muscle injury.—Based on serum muscle enzyme (AST and CK) values from captures of 213 grizzly bears and 172 American black bears, we conclude that significant capture-related muscle injury (i.e., enzyme levels above reference interval values for captive bears) was indicated in samples collected from 102 grizzly bears captures and 134 black bear captures. Further, we believe extreme AST values (>5 times upper reference limit) measured in samples from 7 (6%) grizzly bears and 29 (18%) black bears captured by leghold snare were consistent with the occurrence of exertional (capture) myopathy, a noninfectious disease of wild and domestic animals characterized by damage to skeletal and cardiac muscles and associated with physiological imbalances following extreme exertion, struggle, and stress (Bartsch et al. 1977; Williams and Thorne 1996). Although AST in serum can originate from tissues other than muscle (e.g., liver and red blood cells), its strong positive correlation with concentrations of CK and myoglobin in grizzly bears, and with concentrations of CK in black bears, suggest that it was derived mostly from muscle.

Because serum concentrations of some blood constituents, including muscle enzymes, can be influenced by capture and handling, reference intervals for normal values are difficult to determine in wild species. As an alternative, we used reference intervals for captive grizzly bears and black bears (Teare 2002) as a frame of reference for comparison of muscle enzyme concentrations. Observation that serum muscle enzyme levels in wild black bears immobilized remotely by using drug-filled darts mounted on radiocollars (Powell 2005) are similar to those of captive black bears (mean ± *SD*; wild versus captive: AST—85 ± 15 U/liter versus 101 ± 52 U/liter; CK—133 ± 34 U/liter versus 163 ± 129 U/liter) corroborates comparisons between wild and captive counterparts. In our study, serum AST values in grizzly bears exceeded the upper limit of the reference interval for captive grizzly bears in 48% of samples measured, with the highest value (1,665 U/liter) at 12 times the upper limit, and serum CK values exceeded the upper limit of the reference interval in 40% of samples measured, with the highest value (37,280 U/liter) at 96 times the upper limit. Serum AST values in black bears exceeded the upper limit of the reference interval for captive black bears in 55% of samples measured, with the highest value (5,340 U/liter) at 26 times the upper limit, and serum CK values exceeded the upper limit of the reference interval in 78% of samples measured, with the highest value (109,780 U/liter) at 261 times the upper limit.

Muscle injury associated with capture and handling is the most likely explanation for these differences, a conclusion supported by findings from this and previous studies (e.g., Hellgren et al. 1989; Huber et al. 1997) that confirm that method of capture affects muscle enzyme levels. In general, capture by leghold snare is associated with higher levels of muscular exertion and injury than capture by helicopter darting or barrel trap (Cattet et al. 2003b; Powell 2005). For both species in our study, AST and CK concentrations in serum samples collected from bears captured by leghold snare exceeded the upper limit of reference intervals in greater proportion and magnitude than measured in samples collected from bears captured by other methods.

Serum levels of CK, AST, and myoglobin released from damaged muscle are used to assess occurrence and severity of muscle injury in human and veterinary laboratory medicine (Singh et al. 2005; Williams and Thorne 1996). These measures, however, provide only a ''rough'' indication of the extent of muscle fiber destruction; their accuracy as markers of muscle injury is constrained by the fact that serum concentrations reflect the net outcome of 2 dynamic opposing processes—leakage from damaged muscle and clearance from blood circulation. Nevertheless, there is ample evidence from other studies to suggest that muscle injury was significant, if not severe, in some grizzly bears and black bears based on comparisons of the magnitude of difference between measured values and upper limits for reference intervals. If we consider AST levels, we recorded values ingrizzly bears as much as 12 times the upper limit, and in black bears as much as 26 times the upper limit. By comparison, roe deer (*Capreolus capreolus*) that died of capture myopathy had 3- to 4-fold increases in serum AST level at 6–9 h after capture (Montané et al. 2002); red foxes (*Vulpes vulpes*) with exertional myopathy caused by capture with unpadded leghold traps had AST levels 13- to 16-fold greater than levels measured in free-ranging foxes shot as controls (Kreeger et al. 1990); horses (*Equus caballus*) with severe hind-limb muscle injury (Dabareiner et al. 2004) or severe diaphragmatic necrosis (Valentine et al. 2002) had 3- to 24-fold increases in serum AST level; and children with limbs crushed during an earthquake had 20- to 26-fold increases in mean serum AST level depending on whether 1 limb or multiple limbs were crushed (Dönmez et al. 2001). In addition to comparisons with published data, we also confirmed diagnosis of severe exertional myopathy in a grizzly bear that died 10 days after capture by leghold snare (Cattet et al., in press). Its serum AST concentration at capture (894 U/liter) was 6 times the upper limit of the reference interval for captive grizzly bears.

We suspect that factors contributing to the development of exertional myopathy in snared bears are similar to those identified for other species (Williams and Thorne 1996), primarily extreme stress induced by capture and extreme exertion while struggling to escape the snare. Nonetheless, we have no evidence to suggest that this condition is a direct cause of long-term mortality in bears. Analysis of survival rates in this study suggested that probability of survival for some grizzly bears decreased when AST levels were high, but the effect was weak, with confidence intervals at different AST values overlapping and the confidence interval around the mean probability of survival increasing as serum AST level increased (Fig. 2). We interpret these results to indicate that exertional myopathy may affect survival of some grizzly bears, but if it does, it is more likely as a consequence of altered behavior leading to increased vulnerability to death by hunting or poaching, or less success at acquiring resources (e.g., food and shelter), than as a direct result of adverse physiological effects, for example, circulatory collapse. We have no explanation for why high AST levels had no significant effect on survival of black bears in our study, even though a larger fraction (18% versus 6%) of those caught in snares had extreme values of AST consistent with exertional myopathy.

After muscle injury, increased concentrations of CK and myoglobin persist only a day or two (Lappalainen et al. 2002), and of AST as long as 5–7 days (Krefetz and McMillin 2005; Latimer et al. 2003), unless the injury is progressive. In our study, we found no evidence of persistently high (or low) serum AST, CK, or myoglobin concentrations in bears captured multiple times. Even in grizzly bears and black bears captured 2 or 3 times within periods ranging from 1 to 3 weeks, serum AST, CK, and myoglobin concentrations appeared mostly to reflect method of capture, being high when captured by leghold snare and lower when captured by helicopter darting or barrel trap. Although increases in serum muscle enzymes and myoglobin are short-term after muscle injury, the duration required for injured muscle to heal and for muscle function to return to normal is considerably longer. With minor injury, skeletal muscle can repair and regenerate within 4–8 weeks (Hill et al. 2003; Schneider-Kolsky et al. 2006). With more severe or extensive injury, pathologic changes to muscle structure (necrosis, mineralization, and atrophy) can affect strength and range of motion for a much longer duration (Porzio et al. 1997; Ross et al. 1999).

Mobility after capture.—Immediately after capture, movement rates of grizzly bears and American black bears were reduced for 3–6 weeks before returning to mean levels. Although numerous studies have investigated potential effects of capture on use of space by radiocollared animals (e.g., Chi et al. 1998; Moa et al. 2001; Windberg and Knowlton 1990), we are aware of only a few studies that have looked at movement rates in relation to capture and handling. Amstrup and Beecham (1976) and Craighead and Craighead (1972) concluded that the impact of research activity on daily movement rates of black bears and grizzly bears appeared to be negligible in their respective studies. We found, however, that sensitivity of detecting differences in movement rates of black bears diminished quickly as the interval between location fixes increased, a finding that underscores an advantage of the greater temporal resolution of GPS collars over conventional VHF transmitters, as has been described by others (Obbard et al. 1998; Schwartz and Arthur 1999). Consequently, Amstrup and Beecham (1976) and Craighead and Craighead (1972) may not have detected changes in movement because of long intervals between location estimates.

Our analysis identified that movement rates of bears also were influenced by month of year, day of month, and reproductive class of bear. Other studies have shown that different reproductive classes move at different rates, especially during the spring breeding season when male grizzly and black bears move at greater rates than do females (Amstrup and Beecham 1976; Ballard et al. 1982; Powell et al. 1997). This has been explained as movements of females reflect efforts to secure food sources, whereas movements of males maximize overlap with home ranges of females (Powell et al. 1997; Rogers 1987). Daily movement rates of grizzly bears in our study differed by day of month as well as by month. A plausible explanation for this interaction between day and month is that the grizzly bear study involved animals inhabiting home ranges across a wide elevational gradient (>1,600 m). Between extremes of home ranges in alpine versus low-elevation agricultural areas, differences in local climate (e.g., precipitation and snowmelt) and plant phenology likely affected movement rates of grizzly bears in different ways at different times (Munro et al. 2006). This was especially evident during April and May when snow was still plentiful at higher elevations and bears remained in or near dens, but at lower elevations snow was scarce and bears were moving in search of food. In general, through consideration of these biological and environmental factors and their potential interactions in our models, we were able to account for more bear-to-bear variation in movement rates and increase the power of the analyses to detect capture effects.

Severity of muscle injury, as reflected by serum AST concentrations, affected movement rates of grizzly bears and black bears. However, this effect was evident only in bears with AST levels > 3 times the upper limit of the reference interval. Movement rates also were depressed in bears with low AST levels but this likely was caused by factors other than muscle injury, because the prolonged effect of capture on movement rates occurred in many bears irrespective of capture method used. This finding warrants more detailed investigation of specific and cumulative effects of other stressors that bears may be exposed to during and after capture, for example, sample collection, marking, and carrying radiotransmitters.

Body condition and repeated captures.—The finding that capture and handling affected movement rates for a prolonged period in many bears prompted us to question whether alterations in movement rates could in turn affect assimilation and use of stored energy. As a measure of stored energy, we used a BCI developed for bears that correlates well with the combined mass of fat and skeletal muscle in a bear relative to its body size (Cattet et al. 2002). Because it is not possible to calculate a BCI value for a bear without 1st capturing it, we compared body condition in bears captured once only or captured the 1st time (the control group) to body condition in bears captured repeatedly (≥2 times; the treatment group). We hypothesized that capture and handling affected changes over time in body condition of bears in a negative manner, and the effect would be proportional to the number of times a bear was captured. An implicit assumption in this analysis was that bears captured once and bears captured repeatedly would show similar relationships between body condition and age in the absence of captures. In other words, bears captured repeatedly also were a random sample of the population. This assumption was supported by the fact we were unable to confirm a significant relationship between BCI values for individual bears and their probability of being captured (or recaptured).

We found that body condition in both species tended to increase with age, but rate of change was inversely proportional to number of times a bear was captured, that is, the more often a bear was captured, the lower its age-related rate of change in body condition. Further, this effect became more apparent with age. When translating BCI values into body mass (kg) and comparing between adult bears captured 3 times versus bears of the same age and length captured once, we found a difference in body mass of approximately 14% in grizzly bears and 7% in black bears, and when comparing with bears captured 5 times, a difference in body mass of approximately 25% in grizzly bears and 11–14% in black bears. The significance of a greater effect on grizzly bears is uncertain given that a model without capture effects (model 5 in Table 3a) was marginally supported by our analysis ($\Delta AIC_C = 2.04$). Nevertheless, we conclude that a long-term consequence of capture and handling for both species is a reduction in energy storage and the magnitude of this effect increases with the number of captures. We suggest that this effect may occur because either energy intake is decreased (e.g., reduced foraging), or energy use is increased (e.g., healing of injured tissues), or a combination of both.

The negative effects of capture and handling on body condition have potential, in turn, to affect reproduction and lean body growth negatively, especially in bears captured multiple times. The relationships between body condition and these biological functions have been examined in many mammals (Boltnev et al. 1998; Gittleman and Thompson 1988), including grizzly bears (Stringham 1990b), black bears (Samson and Hout 1995; Stringham 1990a), and polar bears (*Ursus maritimus*—Atkinson and Ramsay 1995; Atkinson et al. 1996). Among bears, solitary adult females that enter dens in autumn in poor body condition are least likely to be seen with offspring the following spring. For those that produce cubs successfully, litter weight at den emergence is dependent upon their body condition in the previous autumn (Atkinson and Ramsay 1995; Samson and Hout 1995). Individuals with better body condition produce heavier cubs. For polar bears, heavier cubs are more likely to survive their 1st spring to summer period on the sea ice (Ramsay and Stirling 1988) and, in the case of females, are more likely to become large adults (Atkinson et al. 1996). We expect that heavier grizzly and black bear cubs also survive better.

Implications for wildlife welfare and research.—Although our findings have important implications for researchers and management agency personnel involved in the capture and handling of bears, we believe they are also pertinent to the conservation, research, and management of other wild carnivores. Indeed, methods of capture we used and types of data we collected are common to many research programs. It seems plausible that different species also will respond similarly when faced with similar stressors. This possibility should at the very least challenge persons capturing wild animals to evaluate their capture procedures and research

9

USING TELEMETRY EQUIPMENT FOR MONITORING TRAPS AND SNARES

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Abstract: Specialized radio transmitters were developed for use in monitoring large mammal trap and snare activity. Prototype devices were manufactured by 4 wildlife telemetry companies based on specifications we developed in consultation with electronic engineering personnel. Power outputs from individual transmitters ranged from 10 to 100 milliwatts (mw). Range testing in the gently rolling terrain of northeastern Colorado indicated that ground-tracking distances with truck-mounted dual beam antennas exceeded 40 km. Field tests were conducted using transmitters with traps and footsnares set for coyotes (*Canis latrans*) in California, black bears (*Ursus americanus*) in Oregon, and mountain lions (*Felis concolor*) in Arizona. Our results indicated that electronic monitoring could be a practical approach to reducing field operating costs and check times for devices set in remote areas. Other applications for the technology, such as use with cage traps in suburban areas, also appear feasible.

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Key words: black bear, *Canis latrans*, coyote, *Felis concolor*, mountain lion, trap, trap monitoring, snare, *Ursus americanus*

In recent years there has been increased interest by wildlife managers in developing telemetry technology for monitoring activity of animals at traps and snares set in remote areas. Decreased time between trap checks could also ensure quicker responses by trappers, thus reducing the likelihood of stress or injury to captured animals. The use of specialized radio telemetry equipment allows for monitoring of multiple trap sites from great distances, expanding the ability of a single trapper to handle numerous, widely spaced sites.

Past attempts to monitor traps and snares using radio transmitters involved the use of modified radio collars or low-powered transmitters (Anderka 1979, Nolan et al. 1984). Some wildlife managers and researchers found this equipment useful, but effective ranges were limited, particularly in remote rugged terrain. The purpose of this study was to develop long-range telemetry equipment and examine its feasibility for monitoring activity of traps and snares in situations where they are essential tools for managing carnivore predation on livestock in the western United States.

We thank federal Animal Damage Control (ADC) personnel S. Dieringer, M. Manning, J. Murdock, W. Robertson, and K. Tope for assisting with field evaluations and the Denver Wildlife Research Center engineering staff for invaluable help in developing specifications and bench-testing prototypes. E. Knittle, Denver Wildlife Research Center, piloted the aircraft and assisted us in conducting initial range tests.

METHODS AND STUDY LOCATIONS

Performance requirements for telemetry equipment were determined based on discussions with ADC personnel. We determined that transmitters needed to have sufficient power to produce a radio signal that could be received over rough terrain at distances >8 km. Also, they were required to be lightweight, durable, weatherproof, and easy to use. Other requirements included replaceable batteries, an on/off switch, and a magnetic switch to change the pulse rate from 30 to 90 pulses/min to signal activity changes.

Companies manufacturing wildlife telemetry equipment were given the specifications and asked to submit prototype transmitters. Four companies submitted 3 prototype transmitters each for our examination. Individual models were identified as A, B, C, and D (Fig. 1). Reference to trade names or commercial enterprises is for identification only and does not constitute endorsement by the authors or the United States Department of Agriculture. All transmitters were initially bench-tested by electronics personnel to determine if power requirements were achieved.

Initial range tests were conducted in the grasslands of northeastern Colorado by attaching each transmitter to a poly-vinyl chloride (PVC) pipe approximately 1 m above the ground. We used a truck-mounted dual beam yagi antenna system to determine maximum transmitter ranges from the same location on the ground. A Cessna 172 aircraft with a wing-

The Custom Electronics telemetry receivers used in this study cost $900; the 4-element yagi antennas cost $80. The transmitters varied in construction, but all were designed to meet the specified performance requirements. Individual units had power outputs ranging from 10 to 100 mw (Table 1). Initial range tests showed reception distances ranging from 18.5 to 40 km on the ground to over 151 km from the fixed-wing aircraft at an above-ground altitude of 915 m.

During field trials, project personnel captured 6 coyotes, 2 bobcats (*Lynx lynx*), 4 black bears, and 3 mountain lions. Transmitters functioned properly and trap activity could be monitored from distances up to 21 km. The transmitter did not appear to affect trapping efficiency during any of the 3 tests.

Electronic monitoring of trap sites improved the efficiency of checking equipment set in remote areas. For example, the time required to check bear snares daily in Oregon was reduced from 8.50 to 2.75 hours. Similarly, the time required for checking mountain lion sets in Arizona was reduced from 12 to 4 hours daily. The ADCS were alerted any time snare throw-arms were sprung, or traps were pulled from their beds. Daily radio monitoring of equipment with transmitters also increased the efficiency of traplines by reducing the time that traps and snares were inoperable due to noncapture or nontarget animal disturbances. The ADCS were able to check equipment more frequently to reduce the time an animal was restrained. Faster response times should be helpful in a variety of situations to reduce injuries or exposure of captured animals.

During all captures, transmitters changed pulse rates as required. However, some problems were encountered with attachments of the magnets to transmitters. In 1 case, a snare was dug up by a small mammal. The snare was pulled off the throw-arm rendering it inoperable. Because the throw-arm did not fire, the transmitter did not change pulse rate and the inoperable set could not be detected. In another instance, a bear entered from the backside of a cubby set and removed the bait without activating the snare or the transmitter. At 1 leghold trap set, an animal activated the trap without moving the magnet on the transmitter switch; thus the pulse rate did not change. At another set, a cow moved the string which pulled the magnet from the transmitter. These examples indicated the need for periodic visual inspections of trap sites, or perhaps additional work on triggering mechanisms for transmitters.

We preferred prototypes with transmitters housed in aluminum flashlight cases. This allowed for easy battery changes and for convenient mounting of the units on nearby trees. Transmitters using magnetic on/off switches were preferred to those with push button type switches. Push button switches were often accidently activated during transport or handling of transmitters; activation could only be detected by use of a radio receiver. Magnetic switches ensure the unit is functioning only when the magnet is removed.

Trap monitoring equipment may have several other potential uses that we did not examine. Transmitters could be used on cage traps, as well as on foothold and snares or other

Figure 2. Trap monitoring transmitter attached to tree.

animal capture devices. They could be utilized in suburban areas where accidental capture of pets may be a potential problem. Telemetry equipment could be used to monitor equipment set to capture bears or lions in suburban areas or in campgrounds where a captured animal may be a threat to human health and safety. Capture devices equipped with transmitters would ensure quick response times when threatened or endangered species such as gray wolves (*Canis lupus*) or grizzly bears (*Ursus arctos*) must be captured. Electronic monitoring might also be useful as a mitigating measure in areas where threatened or endangered species could be inadvertently captured during animal control operations. In many such cases, the cost of telemetry systems would be recovered by increased program efficiency. Nonetheless, the equipment cost, limitations on availability of radio frequencies, and the continuing need for periodic visual inspection of sites will probably limit the current application of electronic monitoring to specific, appropriate situations.

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REVIEW:

WELFARE OUTCOMES OF LEG-HOLD TRAP USE IN VICTORIA

PREPARED BY NOCTURNAL WILDLIFE RESEARCH PTY LTD

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these data may not reflect realistic times for loss of sensibility (Hiltz *et al.* 2001). Assessment of trap performance in an artificial setting cannot fully mimic the conditions and animal behaviours encountered in field situations. Kreeger *et al.* (1990) found that haematological, endocrine and biochemical indicators in wild caught red foxes varied significantly from those habituated and used in captive trials.

8.2 Trap inspection times

Increased periods of confinement in leg-hold traps are associated with correspondingly larger exertion, struggling and injury (Powell *et al.* 2003). Daily inspection of traps set for exotic brushtail possums in New Zealand is mandatory (Warburton 1992, Morris *et al.* 2003) under the Animal Welfare Act (NZ). In Sweden, trap inspection times must not be less than twice per day and this may account for the relatively low injury scores for foxes trapped in leg-hold traps and snares in the trial reported by Englund (1982). In the United States (in 1995), 33 states required that traps must be inspected every 24 hours. Early morning trap checking reduces the level of injury sustained by many trapped animals (Novak 1987, Proulx *et al.* 1994b, Andelt *et al.* 1999). Some researchers inspect traps twice each day in times of excessive heat (Logan *et al.* 1999) or early the following morning (Powell 2005). Trapping of species with high conservation value will often result in more attentive trap inspections such as the setting of traps at dusk and inspection and clearance at dawn (McCue *et al.* 1987).

During the harvesting of Arctic foxes using # 1½ steel-jawed traps, daily inspection was associated with 2/97 (2%) trap deaths compared with 14/58 (24%) deaths where foxes had been held longer (Proulx *et al.* 1994b). In most studies, the period that animals have been held in the trap is almost always imprecise and based upon periods between inspections. Some Australian studies are notable in that they report inspections periods of 48 hours (Stevens *et al.* 1987), irregular inspection periods (Fleming *et al.* 1998) or fail to report inspection periods (Thomson 1992) (Appendix 3). McIlroy (1986) noted that trapping practice for dingoes in south-eastern NSW could be inhumane if traps are not visited each day.

Increasing the frequency of trap inspections and human presence at the trap site is thought to reduce trapping success for wild dogs and is one reason why frequent trap inspection periods are avoided by some trappers (Lee Allen, personal communication). There are no published studies that indicate the degree to which increased frequency of inspection affects trapping success. It should be noted that if traps are inspected at dawn and then at dusk the following day (ie. daily), inspection times may allow some 36 hours to elapse (Fox *et al.* 2004, Iossa *et al.* 2007). Daily (ie. once each 24 hour period) inspection appears to be a minimum accepted world-wide standard to reduce trapping injury and more frequent inspection regimes would produce correspondingly greater welfare benefits.

8.3 Trap anchoring

Leg-hold traps and snares can be attached to fixed anchor points or a 'drag' such as movable objects or a grappling hook. The primary welfare advantage of drags is that an animal can seek cover and there is less resistance when pulling at the cable (Kirkwood 2005). This may be important when traps are set in exposed locations that offer no shelter from the sun, especially in arid environments (Lee Allen, personal communication). However, drags allow some animals to move to areas where they cannot be found. Englund (1982) reported that 13% of foxes held in leg-hold snares moved the drag more than 500 m from point of capture. Some authors consider that the ability of animals to be tangled in snares and trap cables is exacerbated using drags and is responsible for major injury such as fractures and dislocations

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How the United States Was Able to Dodge International Reforms Designed to Make Wildlife Trapping Less Cruel

Tara Zuardo*

1. Introduction

Each year in the United States, more than 6 million animals are trapped in the wild for their fur, primarily with steel-jaw leghold traps, body-gripping kill traps, and strangling neck snares.[1] Although factors such as reduced domestic demand for fur, plummeting pelt prices, and increased public pushback have led to a decline in commercial trapping over the past several decades, the United States continues to be among the world's leaders in the number of wild animals trapped for their fur.

Raccoons, coyotes, muskrats, beavers, red foxes, bobcats, and mink are among the most commonly trapped species.[2] However, official reports are mere estimates (using known data to extrapolate more broadly) and fail to include all animals who are actually trapped. Many unreported nontarget animals fall victim to steel-jaw traps and Conibear traps,[3] including dogs, cats, deer, and birds, as well as threatened and endangered species.[4] Moreover, many wild species, particularly predators such as coyotes, are trapped and killed for wildlife damage management because they are deemed "nuisance" animals.[5] Kills by government-

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[1] Caught By Mistake: Pets Suffer Serious Steel-Jaw Leghold Trap Injuries, ANIMAL WELFARE INSTITUTE (2016), https://awionline.org/awi-quarterly/2016-spring/caught-mistake-pets-suffer-serious-steel-jaw-leghold-trap-injuries.

[2] Ass'n of Fish & Wildlife Agencies, Trap Use Report (2015), available at http://www.fishwildlife.org/files/AFWA_Trap_Use_Report_2015_ed_2016_02_29.pdf.

[3] *See, e.g.*, Christina M. Russo, *"Antiquated" Trapping Laws Can Inflict Torture on Wildlife…And Family Pets*, THE DODO (March 25, 2015), https://www.thedodo.com/wyoming-trapping-laws-1058977987.html.

[4] NOCTURNAL WILDLIFE RESEARCH PTY., WELFARE OUTCOMES OF LEG-HOLD TRAP USE IN VICTORIA (Sept. 2008), http://agriculture.vic.gov.au/__data/assets/pdf_file/0019/261712/REVIEW-WELFARE-OUTCOMES-OF-LEG-HOLD-TRAP-USE-IN-VICTORIA.pdf; G. Iossa et al., *Mammal Trapping: A review of animal Welfare Standards of Killing and Restraining Traps*, 16 ANIMAL WELFARE 335 (2007); BRIAN J. FRAWLEY ET AL., MICH. DEP'T. OF NAT. RESOURCES, FOX AND COYOTE TRAPPING SURVEY, WILDLIFE REPORT DIVISION, no. 3430 (Feb. 2005); Roger Powell & Gilbert Proulx, *Trapping and Marking Terrestrial Mammals for Research: Integrating Ethics, Performance Criteria, Techniques, and Common Sense*, 44 ILAR J. no. 4, 259 (2003); Thomas N. Tomsa & James E. Forbes, FOURTH EASTERN WILDLIFE DAMAGE CONTROL CONFERENCE, Coyote Depredation Control in New York – An Integrated Approach (Sept. 25 1989), http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1039&context=ewdcc4; Gary R. Bortolotti, *Trap and Poison Mortality of Golden and Bald Eagles*, 48 J. WILDLIFE MGMT. no. 4, 1173 (1984).

[5] *See, e.g.*, United States Department of Agriculture Animal and Plant Health Inspection Service, *Resolving Wildlife Damage to Protect People, Agriculture and Wildlife* (2012) (referring to actions targeting "nuisance" animals), https://www.aphis.usda.gov/wildlife_damage/informational_notebooks/2012/Section_1_combined.pdf; Indiana Department of Natural Resources, *Nuisance Wildlife*, http://www.in.gov/dnr/fishwild/2351.htm (last visited March 31, 2017).

5.2.1 Trap check times and lack of enforcement

Even though numerous scientific studies indicate that short trap check intervals greatly reduce injuries to trapped animals,[81] a number of states still allow animals to languish in traps for days. In Montana and Alaska, for instance, there is no mandatory trap check time for most steel-jaw traps, while Wyoming trappers are directed to check steel-jaw traps just once every 72 hours. Where trap-check standards are in place, they are often weak and unenforced. In addition, where trap check times have been established for "furbearers" and other categories of animals, species classified as "nongame" or "predatory"—such as coyotes—may be excluded, allowing victims to suffer indefinitely. New Mexico, for example, excludes coyotes from existing trap check standards.[82] Moreover, there is generally a shortage of enforcement personnel to ensure compliance with existing trapping regulations.

Little attention is given to evaluating the impact of these trapping practices on wildlife populations, and relaxed licensing and record-keeping requirements compound this problem. For instance, New York law does not mandate reporting for furbearers other than bobcats, and a number of states from Nevada to Virginia do not require trapper education courses in order to obtain a permit.[83]

Many states, by their own admission, lack the enforcement personnel in the field to ensure compliance with state trapping (and hunting) regulations. Violations of trapping regulations, as well as poaching of protected species, are commonplace. These violations include (1) failure to check traps as frequently as state regulations require, (2) using traps without the personal identification that is required in most states, (3) trapping of species out of season, and (4) using traps that do not comply with state regulations.

5.2.2 New technologies that reduce suffering are ignored

New technologies are available and, if mandated and used by trappers, capable of greatly reducing the suffering of animals in live traps. One such technology is the use of remote trap monitors, which send a signal to let a trapper know when an animal has tripped and presumably been caught in a trap so that the animal can be promptly removed from the trap.[84] Another technology, albeit one that may come with a regulatory burden, is the use of tranquilizer tabs. Here, the device is equipped with a tab containing a tranquilizing agent; upon capture, the animal bites the tab and ingests the agent, thereby reducing his or her stress and injury.[85]

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[81] NOCTURNAL WILDLIFE RESEARCH PTY., *supra* note 4; Powell & Proulx, *supra* note 4.
[82] *While the World Moves On, US Still Caught in Its Traps*, ANIMAL WELFARE INSTITUTE (2013) https://awionline.org/awi-quarterly/2013-fall/while-world-moves-us-still-caught-its-traps.
[83] *Id.*
[84] Nat'l Wildlife Research Ctr., Evaluation of Remote Trap Monitors (2008), *available at* https://www.aphis.usda.gov/wildlife_damage/nwrc/research/predator_management/content/USDA%20Tech%20Note%20Remote%20Trap%20Monitors.pdf.
[85] Donald Balser, *Tranquilizer Tabs for Capturing Wild Carnivores*, 29 J. WILDLIFE MGMT. 438 (1965); Duane Sahr & Frederick Knowlton, *Evaluation of Tranquilizer Trap Devices (TTDs) for Foothold Traps Used to Capture Gray Wolves*, 28 WILDLIFE SOC'Y BULL. 597 (2000).

12

Mammals of Montana

SECOND EDITION

Kerry R. Foresman
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Beavers cutting tree to obtain smaller branches for food and building material

Until 2007, the largest known beaver dam in the world was near Three Forks, Montana, measuring 2,140 feet long, over 14 feet high, and 23 feet wide at the base. In 2007, a 2,800-foot-long dam, visible from space, was discovered near Wood Buffalo National Park, Alberta, Canada.

Social Behavior: Beavers are also well known for their ability and eagerness to dam up streams, creating beaver ponds. The sound of running water apparently serves as the stimulus for such construction activities. Their engineering skills are quite remarkable. Dams can be 75 to 98 feet (23–30 m) or more in length, although some may even exceed a distance of 0.31 mile (0.5 km). They are constructed from a foundation of rocks and mud upon which tree limbs are piled. Leaves and mud are then packed around the limbs as mortar. Standing water behind these dams provides the beavers with a pool of water around which to move, provides protection from predators, and serves as a storage site for winter food. The beavers often dig a series of intricate canals in association with the pond. Beavers use these aquatic waterways to float vegetation needed for construction of their lodge, the dam, or food cache.

A typical beaver colony consists of four to eight individuals; the adult male and female, their young (kits) from the previous year and, in the spring, kits from the current year. Second-year offspring are forced to leave before the birth of a new litter. Beavers become active toward late afternoon or evening, foraging and reconstructing dams and lodges throughout the night. In early morning, they retreat to their lodge to rest. During winter, beavers will leave the lodge to recover previously stored caches of branches under the ice. They can stay submerged for up to fifteen minutes, although three to four minutes is more common. They are somewhat slow and clumsy on land, so during winter when escape routes back to open water are limited, they rarely come out on land.

When frightened, a beaver will customarily slap its tail on the surface of the water. This behavior, referred to as a warning dive, not only startles a potential predator but warns other beavers of a possible threat. Other beavers respond to the sound by immediately swimming to deep water. The animal making the tail slap will resurface to swim around the intruder and continue to slap the water. Often beavers can be approached quite closely when this occurs.

Note the small feet of the bobcat

Lewis was describing a prime winter pelt at its fullest growth. In addition, both fore- and hind feet are small, with the hind feet the smallest. From a distance, bobcats could be confused with the other medium-sized felid in Montana, the lynx (*Lynx canadensis*). Up close, however, they can be distinguished by color (the lynx is predominantly gray), degree of spotting (spots on the lynx are far less numerous and distinct), ear tufts (those of the lynx are long and showy), and size of feet (those of the lynx are disproportionately large).

Total length ♂ 41 in (104.2 cm)/♀ 37.7 in (93.2 cm)

Tail length ♂ 6.6 in (16.7 cm)/♀ 6.1 in (15.6 cm)

Hind foot ♂ 7.6 in (19.3 cm)/♀ 7.1 in (18.0 cm)

Track size (l x w) Front 2 x 2.1 in (5 x 5.3 cm) Hind 2.1 x 1.9 in (5.3 x 4.8 cm)

Ear ♂ 2.7 in (6.9 cm)/♀ 2.7 in (6.9 cm)

Weight ♂ 25.8 lb (11.7 kg)/♀ 18.7 lb (8.5 kg)

Status Common; classified as a furbearer. In the 2009/2010 trapping season, an estimated 1,428 individuals were harvested.

Distribution

Widely distributed across North America, extending from the southern regions of the Canadian provinces throughout the continental United States and Mexico; found throughout Montana.

Ecology and Behavior

Habitat Preference: The bobcat uses a wide variety of habitat types in Montana, from semidesert grasslands and short-grass prairies, with sagebrush and juniper thickets, to riparian zones characterized by cottonwoods and willows. Dense coniferous forest stands of Douglas-fir, ponderosa pine, lodgepole pine, and Engelmann spruce are also used. In all habitats, the bobcat needs cover and structural complexity not only for hunting but also for protection of nursery dens.

Diet and Foraging Activity: Rabbits and hares make up a majority of the diet, although other small mammals such as voles and mice (family Muridae) are eaten. Where prairie dogs (*Cynomys* spp.) are abundant in the north-central portion of the state, they are actively sought. Ground-nesting bird species, such as grouse and pheasant, are also eaten. The hunting strategy of this species is to wait patiently next to a game trail or a prairie dog colony for an animal to appear. A quick pounce is usually all that is required to dispatch the unsuspecting prey.

Most activity is nocturnal, although early morning and evening movements are common.

Tail length ♂ 7.4 in (18.7 cm)/♀ 6.7 in (17.0 cm)

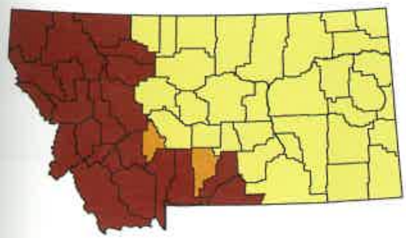
Hind foot ♂ 3.3 in (8.4 cm)/♀ 3.0 in (7.7 cm)

Track size (l x w) Front 2.1 x 2 in (5.3 x 5 cm)
Hind 2.3 x 2.1 in (5.8 x 5.3 cm)

Ear ♂ 1.6 in (4.2 cm)/♀ 1.3 in (3.4 cm)

Weight ♂ 1.9 lb (880 g)/♀ 1.3 lb (568 g)

Status Common; classified as a furbearer, with a trapping season in December. In 2009/2010, an estimated 962 individuals were harvested.



the long coat and bushy tail. Lastly, the fisher (*Martes pennanti*) is black in color with a white throat patch and is three to five times bigger than the American marten. Skull characteristics can also be used to separate these species.

Distribution

Tightly associated with boreal forests and, as such, occurs across the northern region of North America from Alaska through the Canadian provinces, with southern extensions through Washington, Oregon, and California, and along the Rocky Mountains to Colorado and New Mexico. Populations also occur in northern regions of Maine, Vermont, New York, and Minnesota; reintroduction efforts are occurring in Wisconsin and Michigan, some using Montana individuals. Occurs in forested regions of western Montana.

Ecology and Behavior

Habitat Preference: The American marten is one of the most common midsize forest carnivores in northern North America. Although populations have been reduced by loss of habitat and heavy trapping, the American marten is still common, particularly in western Montana. Mesic coniferous forests dominated by subalpine fir, Douglas-fir, and lodgepole pine support the American marten in Montana, particularly stands at late successional stages. Structural complexity at ground level is important for protection, thermal cover, and habitat for prey species. Such cover (shrubs and coarse woody debris that develops from forest decay) is more abundant in older stands. Martens live in talus fields above tree line, but these individuals probably need access to the forested interface.

Diet and Foraging Activity: Martens are dietary generalists, eating a wide variety of vertebrates and plant materials and having distinct seasonal preferences. In spring and summer, small mammals, birds (as well as nestlings and eggs), and insects make up most of the diet. Berries and fruits are eaten as they form in autumn (huckleberry and raspberry are especially preferred). In winter, foraging occurs under the snow in the space provided by complex ground cover. Here martens feed predominantly on voles and mice (in particular the southern red-backed vole [*Myodes gapperi*], montane vole [*Microtus montanus*], and meadow vole [*M. pennsylvanicus*], and the deer mouse [*Peromyscus maniculatus*]). Snowshoe hares (*Lepus americanus*) and red squirrels (*Tamiasciurus hudsonicus*) are also important winter prey. In Montana, nearly 74 percent of scats contained mice and voles, while 12 percent contained squirrels.

American martens are active throughout the year, with a diurnal pattern during summer months and a nocturnal pattern during winter. While foraging, animals investigate any structure that may hide prey. They move rapidly across their home range, using downed logs as runways and periodically stopping to poke into crevices and brush piles.

Dens: The physical structure of older-aged forested stands provides natal and maternal den sites as well as resting sites. Trees, logs, snags, and rock outcroppings are most commonly used. Natal sites, those in which birth occurs, are often in tree cavities in locations with more cover than those chosen for maternal sites. Maternal dens, where kits are raised, are generally *ity of their pelts. Commercial mink farms are still widely found throughout the United States, with several in Montana. Such operations often selectively breed and raise more than ten thousand animals per year, adjusting the pelt color of their stock to accommodate the commercial market. Most fur raised in this country supplies the European market.*

Total length ♂ 23.3 in (59.2 cm)/♀ 18 in (45.7 cm)

Tail length ♂ 7.5 in (19.0 cm)/♀ 5.3 in (13.4 cm)

Hind foot ♂ 2.7 in (6.9 cm)/♀ 2.0 in (5.1 cm)

Track size (lxw) Front 1.7 x 1.8 in (4.2 x 4.4 cm) Hind 1.8 x 1.9 in (4.5 x 4.8 cm)

Ear ♂ 0.9 in (2.2 cm)/ ♀ 0.8 in (2.0 cm)

Weight ♂ 2.4 lb (1.1 kg)/ ♀ 1.0 lb (0.45 kg)

Status Common and locally abundant; classified as a furbearer. Even with a reduced fur market, an estimated 584 animals were harvested in the 2009/2010 season.

HOME RANGES

Mink are not social, preferring to live alone except during the breeding season although home ranges may overlap. Males range more widely than females. Home range size is a function of habitat quality. Along the Madison River, males may travel up to 3 miles (4.9 km) across their home range. Minimum home ranges for two females were 0.03 and 0.09 mi^2 (0.08 and 0.24 km^2). Males from a wetland in Manitoba had an average home range of 2.5 mi^2 (6.5 km^2). Traveling from one end of a home range this large to the other end may require several days, and animals will shelter in dens throughout their home range. Populations may be locally abundant. One 13-square-mile (33.6 km^2) area near Three Forks, Montana, had 280 individuals.

and crayfish are heavily used, particularly during winter. In open prairie habitats, waterfowl may make up over 50 percent of the diet, and other birds, including grebes and coots, may be taken. Food is most often taken back to the den for consumption.

Mink, like other mustelids, remain active all year, foraging primarily at night. Frequent activity may also occur at dawn or dusk. The dense winter underfur of mink greatly enhances the trapping of air and provides increased insulation. During winter, foraging in water is limited to the pursuit of prey after detection from above water. Retention of an air layer, shunting of blood away from the surface, and elevated metabolic heat production help to maintain the animal's core body temperature during foraging.

Dens: Dens are located in log or rock piles, often close to ponds, streams, or marshes. Muskrat dens are used as well, often after the occupants are eaten. These dens have several entrances. Nests are constructed of leaves, grass, and the fur and feathers of prey.

Reproduction

In Montana, breeding extends from late February through early April, with a peak in March. This variation is influenced by temperature, photoperiod, and the date of mating. Females often mate again with a different male six to eight days after their first mating, and the subsequent litter produced will have been sired by two males. Young are born in April or early May. Sexual maturity is attained the following spring, at ten months.

Scientific Discovery

First described by Johann C. D. von Schreber in 1777 from a type specimen obtained in eastern Canada. The scientific name applied at this time is still in use today. The genus, *Mustela*, is Latin for "weasel." The species, *vison*, is of either Icelandic or Swedish origin, a term also meaning "marten" or "weasel." The common name is thought to have originated from the Swedish word *maenk*.

Gestation length 40 days (up to 75 days if delayed implantation occurs)

Litters/year 1

Average litter size 3–5

Weaning 5–6 weeks

The muskrat constructs canals around its home range that connect its lodges and provide access to deeper water. The canals can breach dikes and drain farm ponds and other impoundments, requiring management and control of this species.

Total length 18.1–21.4 in (46.0–54.3 cm)

Tail length 8.7–9.3 in (22.2–23.7 cm)

Hind foot 3.0 in (7.5 cm)

Ear 0.6–0.8 in (1.6–2.1 cm)

Weight 2.0–2.1 lb (913–962 g)

Status Common. Listed as a furbearer; an estimated 12,754 individuals were harvested in 2009/2010, down considerably from the more than 40,000 individuals trapped in 1987, when market prices for fur were higher.

Diet and Foraging Activity: Muskrats are primarily herbivorous, feeding both in late afternoon and late evening on the more common aquatic plants available at any given location. Roots and stems of cattails and bulrush are highly used, although many other plants such as sedges and arrowheads will suffice. Muskrats also eat a large variety of animals, including frogs, fish, freshwater clams, snails, and crayfish.

Nests and Dens: Houses, formed aboveground from available vegetation, typically cattail and bulrush, are of two common types. The most familiar is the dwelling lodge, much the same in appearance as the beaver lodge, although considerably smaller in size. In winter, these lodges are 3.3 to 6 feet (1–2.5 m) in length, 3 to 6 feet (0.9–2.5 m) in width, and 1.3 to 3 feet (0.4–1 m) high, with walls averaging 19 inches (48 cm) in thickness; summer lodges are 12 to 30 percent smaller, with walls half as thick. These lodges have one central chamber (although up to three chambers may be formed in the winter and up to seven in the summer) and are entered from below waterline by one or more tunnels. A second type of house, called the pushup, is typically constructed by pushing submerged aquatic vegetation such as pondweed up into ice cracks, forming a dome above the ice. These pushups and more elaborate feeder lodges are built around and radiate from the main dwelling lodge during winter. These foraging lodges are positioned at distances from the main dwelling lodge that approximate the optimal distance that the muskrat can swim under the ice pack. These way stations allow the animals to forage over a relatively large area during the winter, in relative safety from predation, with only short, periodic forays into cold water.

Muskrat foraging on bank

Tail length ♂ 10.2 in (26.0 cm)/♀ 8.5 in (21.5 cm)

Hind foot ♂ 4.7 in (12.0 cm)/♀ 4.6 in (11.9 cm)

Track size (l x w) Front 2.5 x 2.5 in (6.3 x 6.3 cm) Hind 4 x 2.3 in (10 x 5.8 cm)

Ear ♂ 2.5 in (6.2 cm)/♀ 2.1 in (5.3 cm)

Weight ♂ 15.6 lb (7.1 kg)/♀ 11.9 lb (5.4 kg)

Status Common; classified as a furbearer. In the 2009/2010 trapping season, an estimated 2,626 individuals were harvested.

and grasslands of the east. In the east, they are found in rock coulees, wooded draws, upland croplands, and along hardwood riparian zones of the Yellowstone and Missouri rivers.

Diet and Foraging Activity: The raccoon is omnivorous and will eat berries and nuts, commercial crops such as corn and orchard fruits, aquatic invertebrates (crayfish, snails, and clams), fish, birds, small mammals, and insects. Foraging begins at sunset and continues throughout the night, with animals retreating to resting dens at sunrise. Predation by raccoons on waterfowl, their eggs, and nestlings, may account for significant mortality on refuges such as Ninepipe National Wildlife Refuge in western Montana. Raccoons do not have a strong social structure but will accommodate one another and move together when visiting locally abundant food sources.

Raccoons may wash their food before they eat it, although this behavior may also serve to identify various parts of prey, such as the claws of crayfish. Four digits are highly dexterous and finger activity occurs even when no food is being manipulated.

Dens: Den sites, several in number, may occur in rock crevices, abandoned marmot burrows, caves, or hollow trees. When threatened, raccoons seek refuge in trees. Individuals most often den alone during summer and autumn but may share dens in winter. In fact, twenty-three individuals shared the cellar of an abandoned house. Sharing dens enhances winter survival by allowing individuals to share body heat. Raccoons do not undergo torpor and maintain high body temperatures while resting for extended periods during severe cold spells.

Reproduction

Breeding in Montana probably extends from January into late spring. Young are born from March into early summer.

Gestation length 63 days

Litters/year 1

Average litter size 2-5

Scientific Discovery

First described by Carl Linnaeus in 1758 from a type specimen obtained in Pennsylvania. Originally identified as *Ursus lotor* because it resembles a bear, this species was reassigned to the genus *Procyon* by Gottlieb C. C. Storr in 1780. The genus, *Procyon*, is from Greek *pro*, meaning "before," and *kyon,* meaning "like a dog," an origin not clearly understood. The species, *lotor*, is Latin for "a washer," referring to its perceived habit of washing its food before eating.

Baby raccoon navigating its new environment mals were reintroduced by the Blackfeet Nation on the Blackfeet Indian Reservation (Glacier County) and additional animals were reintroduced on the Fort Peck Reservation between 2006 and 2010.

Ecology and Behavior

Total length 31 in (78.2 cm)

Tail length 10.6 in (27.0 cm)

Hind foot 4.9 in (12.6 cm)

Track size (l x w) Front 1.1 x 1.6 in (2.7 x 4.0 cm)
Hind 1.1 x 1.3 in (2.5 x 3.3 cm)

Ear 2.5 in (6.3 cm)

Weight 5.3 lb (2.5 kg)

Status Species of Concern; rare. The decline of the swift fox had multiple causes: extermination programs oriented toward coyotes and wolves using indiscriminate poison bait sets, heavy trapping pressure in the 1800s, loss of habitat with human westward expansion, and coyote-swift fox incompatibility. Recent changes in coyote control programs and return of the land to native habitat, with the decline of homesteads and small ranches, may be responsible for the observed increases. Swift fox probably survived in isolated pockets in many parts of its historical range. The swift fox is just now making a comeback as a result of reintroductions in Canada, Montana, and South Dakota.

Habitat Preference: When Meriwether Lewis first observed the swift fox on July 6, 1805, he was quite impressed: "There is a remarkable small fox which ascociate in large communities and burrow in the praries something like the small wolf [coyote] but we have not as yet been able to obtain one of them; they are extremely watchfull and take reffuge in their burrows which are very deep; we have seen them now where except near these falls [the Great Falls of the Missouri in Great Falls, Montana]" (Moulton 1987b:364). Two days later, on July 8, Lewis provided a more detailed description, saying: "they are very delicately formed, exceedingly fleet, and not as large as the common domestic cat. their tallons appear longer than any species of fox I ever saw and seem therefore prepared more amply by nature for the purpose of burrowing" (Moulton 1987b:367). Lewis was remarkably perceptive, recognizing not only that this was a new species unknown to science at the time, but that it was an adept burrower closely tied ecologically to the prairies.

Exposed sites on hilltops and slopes in cultivated fields or short-grass prairies are preferred, although heavily grazed sites devoid of shrubs are also used. Dominant vegetation is buffalo grass and blue grama and cultivated fields of winter wheat and alfalfa.

Diet and Foraging Activity: The diet consists of small mammals, birds, reptiles, and invertebrates heavily weighted toward small mammals. Analyses of stomach contents identified lagomorphs, such as the black-tailed jackrabbit (*Lepus californicus*) and cottontail (*Sylvilagus* spp.), most frequently. Deer mice (*Peromyscus maniculatus*), western harvest mice (*Reithrodontomys megalotis*), and pocket mice (*Perognathus* spp.) were also significantly represented, as were songbirds and quail. Most activity is nocturnal, although during cold periods swift foxes are active at midday, sunning themselves at the den entrance.

As the common name implies, this species is indeed very swift, appearing to float across the prairie as it runs. This swiftness is needed to capture its prey and to avoid being preyed upon by hawks and coyotes.

Den Sites: No other North American canid is as strongly subterranean. Elaborate dens are constructed with up to nine entrances and a tunnel system often greater than 3 feet (1 m) in depth and 3 feet (1 m) in length. One report describes a tunnel over 15 feet (4.6 m) long, although most are shorter. Entrances are 7.9 inches (20 cm) in diameter, suggesting that the swift fox does not take over abandoned badger (*Taxidea taxus*) or coyote dens. Dens are often clustered together in groups of three to as many as thirteen. They are used throughout the year, may be maintained by an individual for extended periods, and are often further modified by successive generations.

HOME RANGES

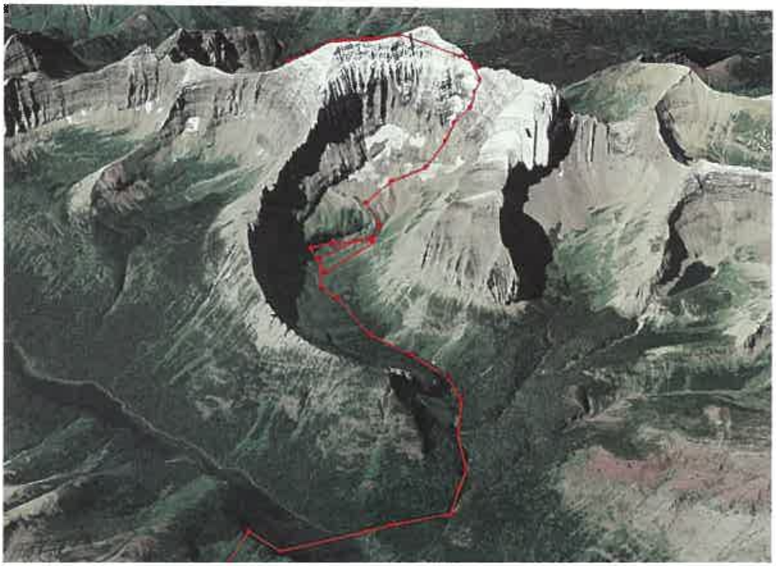
Movement patterns and home range sizes are influenced by terrain, weather, season, and habitat quality. Average daily movements in central Idaho ranged from 2.1 to 4.9 miles (3.4–7.9 km). Maximum movements over a three-day period in western Montana were 39.8 miles (64 km) for males and 23.6 miles (38 km) for females. Male wolverines in Glacier National Park routinely travel more than 93 miles (150 km) in a week. Mean yearly home range size for males was 163 mi² (422 km²) in western Montana, 201 mi² (521 km²) in Glacier National Park, and 803 mi² (2,079 km²) in Idaho; for females these values were 150 mi² (388 km²), 54 mi² (139 km²), and 163 mi² (423 km²), respectively.

and voles (family Muridae), and porcupines (*Erethizon dorsatum*). Insects and numerous plant materials have also been found in scat samples. As deepening snows reduce food abundance at higher elevations, wolverines move down in search of carrion. Scat analyses from populations in Montana and Idaho showed that 80 percent and 74 percent, respectively, contained ungulate material, primarily elk (*Cervus elephus*), deer (*Odocoileus* spp.), and caribou (*Rangifer tarandus*).

Wolverines are nomadic in behavior, traveling widely across the landscape in search of food or, during the breeding season, potential mates. Activity may be primarily nocturnal, or more irregular, with animals alternating between rest and activity throughout the day. Use of remote sensing cameras by the author documented wolverines in the Bitterroot Mountains twice and at the base of the Rattlesnake Mountains once, all three incidents occurring during daylight hours.

Dens: Females use two types of den, natal dens where kits are born and maternal dens where kits are reared. Both are formed by natural cavities created by downed trees (whitebark pine or subalpine fir) or within boulder fields. Both den types are always under a layer of snow 6.5 to 10 feet (2–3 m) deep that persists until late spring. Natal dens are entered in late February; young may be moved to several different maternal dens over the next nine to ten weeks.

Social Structure: Though, as with most mustelids, the wolverine has been considered solitary, recent research in Idaho and Glacier National Park suggests that it may be more social. Siblings may travel with their mother, and once juveniles separate from their mother they may come in contact with their father and travel together. Adult males and females only associate during the breeding season; females will remain with their kits during the first summer following their birth. No well-defined pattern of territoriality occurs. On the contrary, the wolverine's foraging strategy (scavenging) and requisite large home range preclude its ability to maintain a strict territory.



The path of a radio-collared male wolverine that climbed out of the Mokowanis River valley and summited Mt. Cleveland in Glacier National Park in ninety minutes, an elevational change of nearly 5,000 feet (1,524 m)

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Incidental Captures in Montana 2009-2014 license years.

Montana Fish, Wildlife & Parks

January 2016

	2009	2010	2011	2012	2013	2014
Bobcat	2	2	3	7	4	1
Domestic Dog					28	30
Deer				1	1	
Elk					1	
Fisher	2	1		1		1
Grizzly					3	
Wolf				2	1	
Lynx				1	1	1
Marten		1	2			
Mountain Lion	9	8	8	26	26	15
Otter	8	1	7	9	11	2
Raptor				1	2	2
Swift Fox		2		2		1
Wolverine					2	2
Total	**21**	**15**	**20**	**50**	**80**	**55**

14

Table G. Animals Taken by Component/Method Type and Fate by Wildlife Services in Montana - FY2014

Capture / Restraint Method ^	Intentional / Unintentional	Species	Killed / Euthanized	Removed/ Destroyed	Freed / Released / Relocated	Dispersed
Drc-1339-Feedlots						
	Intentional					
		Starlings, European	40			
Drc-1339-Livestock/Nest/Fodder						
	Intentional					
		Ravens, Common	189			
Drc-1339-Pigeons						
	Intentional					
		Pigeons, Feral (Rock)	50			
Firearms						
	Intentional					
		Badgers	1			
		Bears, Black	5			
		Coyotes	876			
		Crows, American				5
		Doves, Mourning	50			1,180
		Ducks, Mallards	4			16
		Falcons, American Kestrels				9
		Foxes, Red	1			
		Geese, Canada	2			4
		Geese, Snow, Lesser				7

^About Capture/Restraint Method: This column reports the primary method or tool used to capture, restrain, or identify/target the animals addressed. This MAY NOT have been the method or tool used to kill, euthanize, or free/relocate, the animal captured. When animals are captured and/or restrained, WS employees use methods or tools to euthanize, and approved handling and transport are used to free or relocate.

Table G. Animals Taken by Component/Method Type and Fate by Wildlife Services in Montana - FY2014

Capture / Restraint Method ^	Intentional / Unintentional	Species	Killed / Euthanized	Removed/ Destroyed	Freed / Released / Relocated	Dispersed
Firearms						
	Intentional					
		Gulls, Ring-Billed	4			1
		Hawks, Harrier, Northern (Marsh Hawks	1			33
		Hawks, Red-Tailed	1			89
		Hawks, Swainson`s	2			26
		Herons, Great Blue				2
		Larks, Horned				18
		Lions, Mountain (Cougar)	2			
		Magpies, Black-Billed	10			192
		Meadowlarks, Western	2			125
		Pigeons, Feral (Rock)	228			
		Rabbits, Cottontail	2			
		Ravens, Common	5			8
		Robins, American				3
		Sparrows, House/English	1			
		Squirrels, Ground, Richardson`s	868			396
		Starlings, European	55			1,545
		Vultures, Turkey				13
		Wolves, Gray/Timber	13			
Fixed Wing						

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Table G. Animals Taken by Component/Method Type and Fate by Wildlife Services in Montana - FY2014

Capture / Restraint Method ^	Intentional / Unintentional	Species	Killed / Euthanized	Removed/ Destroyed	Freed / Released / Relocated	Dispersed
	Intentional					
		Coyotes	604			
		Wolves, Gray/Timber	3			
Gas Cartridge, Large						
	Intentional					
		Coyotes	1			
		Coyotes (Burrow/Den)		24		
		Foxes, Red (Burrow/Den)		13		
Helicopter						
	Intentional					
		Coyotes	2,180			
		Foxes, Red	11			
		Wolves, Gray/Timber	25		2	
M-44 Cyanide Capsule						
	Intentional					
		Coyotes	418			
		Foxes, Red	11			
	Unintentional					
		Foxes, Red	1			
Pyrotechnics (All)						
	Intentional					
		Falcons, American Kestrels				4

^About Capture/Restraint Method: This column reports the primary method or tool used to capture, restrain, or identify/target the animals addressed. This MAY NOT have been the method or tool used to kill, euthanize, or free/relocate, the animal captured. When animals are captured and/or restrained, WS employees use methods or tools to euthanize, and approved handling and transport are used to free or relocate.

Table G. Animals Taken by Component/Method Type and Fate by Wildlife Services in Montana - FY2014

Capture / Restraint Method ^	Intentional / Unintentional	Species	Killed / Euthanized	Removed/ Destroyed	Freed / Released / Relocated	Dispersed
Pyrotechnics (All)						
	Intentional					
		Hawks, Red-Tailed				14
Snares, Foot/Leg						
	Intentional					
		Bears, Black	5			
		Bears, Grizzly			4	
		Lions, Mountain (Cougar)	2			
Snares, Neck						
	Intentional					
		Badgers	3			
		Bobcats	1			
		Coyotes	539			
		Foxes, Red	41			
		Lions, Mountain (Cougar)	2			
		Rabbits, Cottontail	4			
		Raccoons	4			
		Skunks, Striped	2			
	Unintentional					
		Badgers	1			
		Deer, White-Tailed (Wild)	1			

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Table G. Animals Taken by Component/Method Type and Fate by Wildlife Services in Montana - FY2014

Capture / Restraint Method ^	Intentional / Unintentional	Species	Killed / Euthanized	Removed/ Destroyed	Freed / Released / Relocated	Dispersed
Snares, Neck						
	Unintentional					
		Foxes, Red	1			
		Porcupines	1			
		Pronghorns (Antelope)			1	
		Skunks, Striped	1			
Traps, Cage						
	Intentional					
		Lions, Mountain (Cougar)	2			
		Skunks, Striped	1			
	Unintentional					
		Bears, Black			1	
Traps, Culvert						
	Intentional					
		Bears, Black	1			
		Bears, Grizzly			2	
Traps, Decoy						
	Intentional					
		Vultures, Turkey	22			
Traps, Foothold						
	Intentional					
		Badgers	2			

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Table G. Animals Taken by Component/Method Type and Fate by Wildlife Services in Montana - FY2014

Capture / Restraint Method ^	Intentional / Unintentional	Species	Killed / Euthanized	Removed/ Destroyed	Freed / Released / Relocated	Dispersed
Traps, Foothold						
	Intentional					
		Cats, Feral/Free Ranging	1			
		Coyotes	128			
		Foxes, Red	21			
		Lions, Mountain (Cougar)	4			
		Porcupines	1			
		Skunks, Striped	16			
		Wolves, Gray/Timber	6		13	
	Unintentional					
		Badgers	1		1	
		Bears, Black			2	
		Domestic Animal (Pet Or Livestock)			1	
		Lions, Mountain (Cougar)			1	
Vehicles (All)						
	Intentional					
		Eagles, Bald				7
		Total Take for MT	6,480	37	28	3,697

^About Capture/Restraint Method: This column reports the primary method or tool used to capture, restrain, or identify/target the animals addressed. This MAY NOT have been the method or tool used to kill, euthanize, or free/relocate, the animal captured. When animals are captured and/or restrained, WS employees use methods or tools to euthanize, and approved handling and transport are used to free or relocate.

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Trapper Education Manual

A Guide for Trappers in the United States

Safety - Animal Welfare - Responsibility - Furbearer Conservation

Acknowledgements

Funding for trapper education student manual and related materials was provided by the U.S. Fish and Wildlife Service and the International Association of Fish and Wildlife Agencies (IAFWA) through a Pittman-Robertson Wildlife Restoration Multi-state Grant. The copyright is held by the IAFWA. Materials for print developed under the grant are free for use by state, provincial, and territorial fish and wildlife agencies. Images used in the manual come from many sources including public domain collections, state and federal agencies, and private companies. Most of the images require separate licensing for use in other types of publications.

Hundreds of individuals have contributed to the development of the IAFWA Trapper Education Program. Most state and provincial wildlife agencies provided copies of their trapper education materials for review. Many agency personnel provided comments on materials, answered questions, ran pilot courses, or helped in other ways. Many trappers, including members of the National Trappers Association and the Fur Takers of America also contributed. Special thanks go to the Ohio Division of Wildlife, the Ohio State Trappers Association, Hal Sullivan, Pat Howard, and Doug Wilson.

Members of the steering committee spent many hours reviewing documents, attending meetings, and providing advice as the program developed over two years. Committee members include: Tom Decker, Vermont Fish and Wildlife Department; Steve Hall, Texas Parks and Wildlife Department; Susan Langlois, Massachusetts Division of Fisheries and Wildlife; Eric Nuse, International Hunter Education Association; John Organ, U.S. Fish and Wildlife Service; Judy Stokes, New Hampshire Fish and Game; and Rick Tischaefer, Trapper Education Consultant, North Dakota.

Samara Trusso, Program Manager of the IAFWA, coordinated the development of the Trapper Education Program. The materials were developed through a contract with Silvertip Productions, Ltd. Jim Wentz of Silvertip served as the primary author of the documents.

State Equal Opportunity Statement

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CDC--Center For Disease Control; Eyewire.com; FWS – U.S. Fish and Wildlife Service; IAFWA; Joe Goodman, Artist, Courtesy of IAFWA; Natalene Cummings, Artist, Courtesy of IAFWA; Massachusetts Division of Fisheries and Wildlife; Conservation Commission of the State of Missouri; Ohio Division of Wildlife & Hal Sullivan; Silvertip Productions, Ltd. & Mary Wentz, Jim Wentz, Mike McNeese; Texas Parks and Wildlife Department & Steve Hall; USDA – United States Department of Agriculture; USGS - United States Geological Survey; Nielsen/Painet - Erwin C. Nielsen/Painet Inc.; Wisconsin Department of Natural Resources; Wyoming Game and Fish Department & Chris Madson

Describe the advantages of pre-season scouting

During pre-season scouting trips find specific places to make your sets and plan the materials you need. Make notes of what you find and sketches of areas that look promising. This will allow you to set your traps out quickly when the season opens.

If you wait until the season opens to scout it will be time-consuming and difficult to cover ground carrying your equipment. Scouting during the season may alert wary furbearers such as fox and coyotes. Pre-season planning allows you to make sets quickly and leave the area without creating much disturbance.

Silvertip Productions

Pre-season scouting leads to success

Make a commitment to check your traps at least once every day

When you set out a trapline, you assume responsibilities. Animal welfare is a top priority. Most furbearers are nocturnal so it is best to check your live-restraining traps at first light each morning. If you cannot check them at daylight, check them as early in the day as possible.

One important difference between trapping and hunting is your commitment to work your trapline every day until you remove your traps. Hunters can choose the days they want to hunt, but trappers must check their sets every day. Bad weather or other problems should not change your plans.

If you cannot personally fulfill your responsibility to wildlife and fellow trappers because of illness have another licensed trapper check your line. If a licensed friend or family member knows where your sets are located they can check or remove your traps for you. Keep notes and sketches showing where to find your traps.

Check your state trapping or furbearer regulations for information on how often you are required to check your traps. Regardless of the law, responsible trappers will visit their traps daily. It is good for animal welfare, and it will increase your success.

State three or more reasons to check your traps early each morning

There are many good reasons to check your traps early each morning:

- Animal welfare
- Prevent escape from live-restraining traps
- Release non-target animals

Why daily checks increase success!

- Less chance animals or traps will be stolen
- If traps have been disturbed you can remake the set
- Less chance for predation
- Less chance an animal will escape from a restraining device
- Less chance an animal will injure itself or damage its pelt
- If you remove an animal and set the trap again you may catch another one
- Most furbearers are active at night (nocturnal), so check your traps early each day

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Best Management Practices for Trapping in the United States

INTRODUCTION

ASSOCIATION of FISH & WILDLIFE AGENCIES

The Association of Fish and Wildlife Agencies (AFWA), formerly the International Association of Fish and Wildlife Agencies (IAFWA), was founded in 1902. It is an organization of public agencies charged with the protection and management of North America's fish and wildlife resources. The 50 state fish and wildlife agencies, as well as provincial and territorial governments in Canada, are members. Federal natural resource agencies in Canada and the United States are also members. The Association has been a key organization in promoting sound resource management and strengthening state, provincial, federal, and private cooperation in protecting and managing fish and wildlife and their habitats in the public interest.

Credits:
Editing and Design-
Devaney & Associates, Inc.
Illustrations-Joe Goodman and
Natalene Cummings

Acknowledgements

Best Management Practices (BMPs) for Trapping in the United States was written by the Furbearer Conservation Technical Work Group of the Association of Fish & Wildlife Agencies. Development of this document would not have been possible without the cooperation and participation of many state wildlife agencies, expert trappers and trapper organizations. State agency personnel provided on-the-ground coordination and supervision in those states where BMP trap testing occurred, and many agency staff members provided constructive comments on earlier drafts of this document. We thank the wildlife veterinarians at the University of Georgia, the University of Wyoming and Wildlife Health Associates who completed evaluations of captured animals.

We thank the members of trapper associations, individual trappers and technicians who took part in field-testing that supported the development of these BMPs. Their hard work and commitment to the continued improvement of trapping in the United States was an essential contribution to the success of this project. We also appreciate the involvement of the National Trappers Association from the inception of the BMP process and would like to acknowledge their continuing assistance and support.

We are indebted to the Fur Institute of Canada (FIC) for providing valuable information on the animal welfare of furbearers captured in bodygrip traps and the mechanical attributes of both bodygrip and foothold traps. Their research has provided the information needed for inclusion of many important trapping devices in the respective BMPs and would have been practically impossible to obtain otherwise.

We also extend our appreciation to the many cooperating landowners who permitted BMP trap testing to be conducted on their property. They have made a significant contribution to the future of furbearer management in the United States.

The U.S. Department of Agriculture (USDA) provided funding for trapping BMP research and development. The International Fur Trade Federation provided additional funding, and many state agencies made substantial in-kind contributions.

Mission Statement

The Furbearer Conservation Technical Work Group is composed of wildlife biologists from state fish and wildlife agencies throughout the United States. Regional representation is from the Northeast, Southeast, Midwest, West and Alaska.

The mission of the Furbearer Conservation Technical Work Group of the Association of Fish & Wildlife Agencies is to maintain the regulated use of trapping as a safe, efficient and acceptable means of managing and harvesting wildlife for the benefits it provides to the public, while improving the welfare of trapped animals.

BMPs are based on the most extensive study of animal traps ever conducted in the United States. Test traps were selected based on knowledge of commonly used traps, previous research findings and input from expert trappers. Statisticians from universities and federal and state agencies developed rigorous study designs. Experienced wildlife biologists and trappers developed study procedures, supervised or participated in field research and provided insight and expert technical advice on trapping methods to ensure the completion of each project. Data collection, including safety evaluations, was undertaken following widely accepted international standards for testing traps specified in the International Organization for Standardization (ISO) Documents 10990-4 and 10990-5. Wildlife biologists and statisticians assisted in data analysis and interpretation during the development of this document.

Although many details of trap testing procedures and results are available in other documents, some understanding of the procedures is important and can be gained by reading this document.

Best Management Practices

Wildlife professionals, trappers and trapper associations historically have worked to improve trapping. Most of the advancements used today come from the efforts of trappers. Wildlife agencies have a long history of regulating trapping to assure that the traps and trapping systems being used are the best available. State fish and wildlife agencies must continue to take a lead role by establishing a practical and effective plan for the improvement of trapping systems in order to maintain trapping as a valuable wildlife management practice.

The BMP framework provides a structure and criteria for identifying and documenting trapping methods and equipment that will continue to improve trapping. The trapping BMP project is intended to provide wildlife management professionals in the United States with the data necessary to ensure improved animal welfare in trapping programs. Trapping BMPs are based on scientific research and professional experience regarding currently available traps and trapping technology. Trapping BMPs identify both techniques and traps that address the welfare of trapped animals and allow for the efficient, selective, safe and practical capture of furbearers.

Trapping BMPs are intended to be a practical tool for trappers, wildlife biologists, wildlife agencies and anyone interested in improved traps and trapping systems. BMPs include technical recommendations from expert trappers and biologists and a list of specifications of traps that meet or exceed BMP criteria. BMPs provide options, allowing for discretion and decision making in the field when trapping furbearers in various regions of the United States. They do not present a single choice that can or must be applied in all cases. The suggestions contained in this document include practices, equipment and techniques that will continue to ensure the welfare of trapped animals, avoid unintended captures of other animals, improve public confidence in trappers and wildlife managers, and maintain public support for trapping and wildlife management.

Trapping BMPs are recommendations to be implemented in a voluntary and educational approach. The trapping BMPs are the product of ongoing work that may be updated as additional traps are identified in the future. BMPs are intended to compliment and enhance trapper education programs. It is recommended that all trappers participate in a trapper education course. Trapping BMPs provide additional technical and practical information to help trappers and managers identify and select the best traps available for a given species and provide an overview of methods for proper use.

Criteria for Evaluation of Trapping Devices

For the purpose of developing trapping BMPs, thresholds were established by the Furbearer Conservation Technical Work Group of AFWA for several trap performance criteria. These thresholds were derived from reference standards annexed to the 1997 understanding reached between the United States of America and the European Community and with input from wildlife biologists and wildlife veterinarians involved in this effort. These thresholds provide a common framework for evaluating progress toward the use of more humane traps and trapping methods. Assessments of injury were undertaken in the furtherance of such common framework.

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Trapping & Furbearer Management in Montana

What's New:

- » **News Release:** FWP puts mandatory trapper education on hold (March 6, 2018)
- » Center Swivels for 2019 Season (PDF 107 KB)

Fur trapping is highly regulated, biologically sustainable, and an important part of Montana's cultural history and outdoor lifestyle.

FWP is responsible for the conservation of furbearers and for regulating the responsible use of this public resource. FWP and its citizen commission continually refine furbearer trapping regulations to ensure sustainability, selectivity, and ethical harvest.

Regulated trapping can provide many benefits to society, including:

- Reducing wildlife damage to crops and property,
- Reducing threats to human health and safety,
- Population monitoring information including trends, distribution, reproductive data, presence of toxins, etc.

Best Management Practices for Trapping

- » Modern Snares for Capturing Mammals (PDF 594 KB)
- » Introduction: Best Management Practices for Trapping in the United States (PDF 686 KB)
- » Bodygrip Traps on Dryland (PDF 10.9 MB)
- » American Marten (PDF 4.2 MB)
- » Badger (PDF 2.9 MB)
- » Beaver (PDF 1.8 MB)

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National Trappers Association

6. HSUS Statement: Commercial trapping is not a "wildlife management tool". There are no bag limits and no limits on the number of traps that can be set. Trapping activity is driven by the price of pelts, not by the need to manage wildlife populations. Some fur-bearers (coyotes for instance) have natural fertility and breeding controls when not disturbed by humans, while others (such as muskrats) experience natural boom-and-bust cycles.

Factual Rebuttal: The professional wildlife conservation community universally endorses traps and trapping as critical and essential wildlife management tools. The Wildlife Society and the International Association Of Fish and Wildlife Agencies are the largest international organizations representing professional wildlife conservation employees and governmental wildlife agencies. Both organizations have issued policy statements that strongly support the role commercial trapping plays in achieving wildlife management objectives.

Harvest season length, bag limits, permissible size and types of traps, and total number of traps permissible per trapper, are all considered during the development of management strategies for individual species. Population growth characteristics of some species require strict harvest regulations that include bag limits and limiting the number of traps per individual. Conversely, harvest and population characteristics of other species require liberal regulations to meet prescribed furbearer management objectives.

All wildlife populations possess inherent bio-feedback mechanisms that eventually limit population densities. Most species can exhibit classic 'boom and bust cycles'. The reproductive capabilities of coyotes, muskrats and many other furbearers allow non-regulated populations to increase at exponential rates until they approach and/or surpass the carrying capacity of their respective ecosystems (boom). When this occurs, competition for limited resources compromises the health of the entire population. At that time, the weakened condition of these animals allow density-dependent mortality factors such as starvation, disease, and social strife, to decimate entire populations (bust). Oftentimes, the health of the entire ecosystem including all aligned wildlife species and the public are also negatively impacted by these inflated furbearer populations.

Regulated commercial trapping manages populations by moderating the extremes of 'boom and bust' cycles. This results in stable populations of healthy animals that are in balance with the biological carrying capacity of their ecosystems and the cultural carrying capacity accepted by the general public.

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Journal of Mammalogy, 92(1):235–253, 2011

Guidelines of the American Society of Mammalogists for the use of wild mammals in research

ROBERT S. SIKES,* WILLIAM L. GANNON, AND THE ANIMAL CARE AND USE COMMITTEE[1] OF THE AMERICAN SOCIETY OF MAMMALOGISTS

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Guidelines for use of wild mammal species are updated from the American Society of Mammalogists (ASM) 2007 publication. These revised guidelines cover current professional techniques and regulations involving mammals used in research and teaching. They incorporate additional resources, summaries of procedures, and reporting requirements not contained in earlier publications. Included are details on marking, housing, trapping, and collecting mammals. It is recommended that institutional animal care and use committees (IACUCs), regulatory agencies, and investigators use these guidelines as a resource for protocols involving wild mammals. These guidelines were prepared and approved by the ASM, working with experienced professional veterinarians and IACUCs, whose collective expertise provides a broad and comprehensive understanding of the biology of nondomesticated mammals in their natural environments. The most current version of these guidelines and any subsequent modifications are available at the ASM Animal Care and Use Committee page of the ASM Web site (http://mammalsociety.org/committees/index.asp).

Key words: animal capture, animal care, animal housing, animal marking, animal use ethics, federal regulation, Institutional Animal Care and Use Committee, trapping

DOI: 10.1644/10-MAMM-F-355.1

ORGANIZATION OF GUIDELINES

disseminated as a position statement and addendum to the 2007 version of these guidelines in 2010. The portions of this joint position relevant to work with mammals are included here.]

Two aspects of animal usage classification can cause confusion where activities involving wild animals are concerned: classification of the capture of free-ranging animals within the USDA reporting categories of pain and distress; and identification of field studies for the purpose of determining when IACUC protocol review and IACUC site inspection are required.

United States Department of Agriculture reports: pain and distress categories.—The AWA (7 USC 2143(b)(3)(A)) and the implementing regulation (9 CFR 2.36) require that research facilities in the United States subject to these laws file an annual report with the USDA Animal Care Regional Office documenting their research and teaching activities that used live animals covered by the AWA and its implementing regulations. A component of this report is classification of animal usage into categories intended to describe the absence, presence, or extent of pain or distress and the use of drugs to alleviate these conditions.

United States Department of Agriculture descriptions for animal reporting categories as defined on the reporting form (APHIS Form 7023) are:

C—Animals upon which teaching, research, experiments, or tests were conducted involving no pain, distress, or use of pain-relieving drugs.

D—Animals upon which experiments, teaching, research, surgery, or tests were conducted involving accompanying pain or distress to the animals and for which appropriate anesthetic, analgesic, or tranquilizing drugs were used.

E—Animals upon which teaching, experiments, research, surgery, or tests were conducted involving accompanying pain or distress to the animals and for which the use of appropriate anesthetic, analgesic, or tranquilizing drugs would have adversely affected the procedures, results, or interpretation of the teaching, research, or experiments, surgery, or tests. (An explanation of the procedures producing pain or distress on these animals and the reasons such drugs were not used must be attached to the report.)

Guidance for classifying painful procedures is provided in Policy 11 of the *Animal Care Resource Guide: Animal Care Policy Manual* published by the Animal Care Program of the USDA, APHIS (1997). However, this minimal guidance and the examples given therein pertain to procedures conducted in a laboratory setting, usually in the context of biomedical research.

Classification becomes especially problematic when institutions are faced with applying regulations intended primarily for laboratory settings to the very different context of free-ranging animals. The 2 critical terms in these descriptions are ‘‘pain’’ and ‘‘distress.’’ According to the *Animal Care Resource Guide: Animal Care Policy Manual* (Animal Care Program, USDA, APHIS 1997), Policy 11, a painful procedure is defined as one ‘‘that would reasonably be expected to cause more than slight or momentary pain and/or distress in a human being to which that procedure is applied, that is, pain in excess of that caused by injections or other minor procedures.’’ Distress is not defined in current policy except by example: ‘‘Food or water deprivation beyond that necessary for normal presurgical preparation, noxious electrical shock that is not immediately escapable, paralysis or immobility in a conscious animal.’’ The principal investigator and the institution must then contend with the task of determining the appropriate classification of captured mammals.

United States Department of Agriculture classifications as applied to animal capture and noninvasive field procedures.—Mammal capture devices are designed either to hold the animal unharmed (live traps) or to kill the animal outright upon capture. Barring mechanical malfunctions and with appropriate placement and trap checking frequency, animals captured in live traps or nets are simply held without injury until removal. Appropriate training is essential for setting capture devices and for removing animals from those devices. Pain or distress, as described in the *Animal Care Resource Guide: Animal Care Policy Manual* (Animal Care Program, USDA, APHIS 1997), is unlikely to result from the simple capture of free-ranging mammals using most live traps or capture techniques approved by the ASM, so animal usage in these instances is consistent with USDA Category C.

Most tissue sampling and marking techniques in the field also are consistent with USDA pain Category C provided that procedures are not more invasive than peripheral blood sampling. Support for this classification is provided in the *Guidelines for Preparing USDA Annual Reports and Assigning USDA Pain and Distress Categories* (National Institutes of Health, Office of Animal Care and Use 2009). This document is distributed by the National Institutes of Health Office of Animal Care and Use, which is the oversight office for intramural research. This guidance expressly states that Category C includes most blood-collection procedures and tissue-collection procedures that involve no or only momentary or slight pain. Based on these same National Institutes of Health guidelines, USDA Category C is also appropriate in instances where protocols requiring peripheral tissue sampling or tagging and release of free-ranging animals necessitate chemical immobilization to conduct the procedures, provided that immobilization is performed only to facilitate the procedure and protect the animal and the researcher from injury rather than to alleviate pain or distress induced by the procedure.

Free-ranging mammals captured in live traps and subsequently euthanized as part of the research study or that are taken in properly functioning kill traps meet the standards for either USDA Category C or Category D; the distinction between these reporting categories depends upon how the animal is killed. Category C appropriately applies to animals taken in live traps if the animals show no obvious signs of pain

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AVMA
Our Passion. Our Profession.

Trapping and Steel-jawed Leghold Traps

The AVMA opposes the use of conventional (non-padded, non-offset) steel jawed foothold traps (also called leghold traps).

Comment on this policy

When the capture of wildlife must occur (e.g. for management or research purposes), humane traps and techniques should be employed that minimize injury, stress, pain, and suffering to wildlife while also seeking to avoid capture of non-target animals. The AVMA recommends that trappers should be trained to use traps and techniques correctly and traps should be checked at least once every 24 hours.

The AVMA encourages active research on improvement of capture devices and trapping methods for wildlife, taking into regard the provision of good welfare. Anyone using traps should refer to the Association of Fish and Wildlife Agencies Policy for Best Management Practices for Trapping in the United States*.

*Association of Fish and Wildlife Agencies' Best Management Practices in the U.S. http://fishwildlife.org/?section=best_management_practices accessed March 25, 2017.

Literature Review:

Welfare Implications of Leghold Trap Use in Conservation and Research

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Summary of Public Comments

FWP received and reviewed a total of 282 comments and letters.

Close to half the comments had some focus on wolves specifically.

160 comments (57%) identified as being against all trapping, most often describing the activity as "inhumane." 78% of these were from outside of Montana. About 20% were one of several form letters. Several of these comments included language such as "torture," "sinful," "barbaric," "sadistic," "ignorant," and "criminal." One comment was threatening.

Of these 160 comments where it was clear that the person was against all trapping in general, 80% did not express an opinion on the specific issues in the proposal. Therefore, nearly half the public comment seemed to be an expression of the desire to simply eliminate trapping.

Of those who oppose trapping in general that did express an opinion on proposal specifics, 100% were in favor of a 24-hr check, and 100% were in favor of the proposed Modifications. When an opinion was expressed on the subject, this group was against Mandatory Education by a 4:1 margin. The most frequent reasoning given for opposing Education was that a class that included involvement by the Montana Trapper's Association would be "unfair to non-consumptive users." Most of the comments that opposed Mandatory Education appear to have initiated from a form letter by Wolves of the Rockies.

43 comments (15%) were from trappers, all but two from Montana. Of those who identified as trappers, 86% were for Mandatory Education, 83% were against Modifications, and all were against a 24-hr check. Many expressed that Mandatory Education and recommendations by FWP (rather than regulation) was the best way to achieve more the humane treatment of animals that Modifications and a Check-time are targeted toward.

Of those who did not specifically identify as a trapper or as being against all trapping in general, about half were for and half against Mandatory Education, about half were for and half against Modifications. 83% of this group expressed support for a 24-hr trap check.

99.9% of Montanans did not comment on this proposal.

Recommendations:

Mandatory Education

Mandatory trapper education should move forward as outlined. Developing and implementing a world-class program will be a serious and demanding undertaking and should be given high priority during the coming year. When done well, this program will improve many aspects of trapping in Montana for decades, including minimizing capture of non-targets and use of best practices (equipment and checks) that result in humane treatment of captured animals.

Public Comment Summary for June 2017 Trapping Proposal

Suggest striking the requirement to take the class again if a person has not purchased a license during the last 5 years. Several questions about exactly who does and does not have to take the class indicates the need to clarify in a succinct manner and via FWP media.

Modifications:

Retain the requirement for swivels as is. This modification is inexpensive and beneficial, and it did not receive any significant opposition. Strike the requirement for offsets and thicknesses. The details of these elements have not been thoroughly discussed and considered. They are expensive and time-consuming to implement, and thus any regulations that may arise regarding these elements should be based on a fully informed and exhaustive discussion prior to requiring specific changes.

It is important to note that the Association of Fish and Wildlife Agencies makes clear that their Best Management Practices were developed to be utilized as recommendations and not as the basis for regulations. If Montana moves to require elements identified as positive in the trapping BMP's, Montana will be moving toward a system that is used in Canadian Provinces where there is a list of approved traps.

Check Time

FWP should have a maximum time allowed legally between trap checks as a means of dealing with the occasional instance of negligence. Such a regulation would allow enforcement to pursue clear cases of negligence and would likely encourage reduced trap check intervals for some who currently check at "too long of an interval."

Of course, "too long of an interval" is subjective and dependent on an individual's judgement of what is ethical. Clearly there are wide and divergent opinions among the public regarding what is ethical or "too long of an interval." For some, any instance of trapping at all is unacceptable and unethical treatment of animals. For others, some of whom are trapping for purposes of reducing impacts of predators on livestock and livelihoods, the intent and need is to kill the animal by whatever means possible. Most who are trapping classified furbearers do not fall into either of the aforementioned categories. Perhaps for most Montanans, a group that did not comment on this proposal, the ethics of how long is too long to have an animal in a trap is a personal and individual decision that varies. An individual's judgement on how long is too long may also depend on situational specifics such as the likelihood of a capture, weather, or personal risk. FWP biologists and the Fish and Wildlife Commission have for many decades seemed to hold this flexible view that depends on personal ethics, having instituted a recommendation for a 48 hour check.

It should also be noted that a check time regulation will be very difficult to enforce. It is simply not feasible for FWP enforcement to "have a stopwatch ticking" on all trap-lines or even many trap-lines. Thus the effectiveness of a check-time toward achieving its desired outcome must be weighed against the pros and cons of other approaches.