State of California – Fish and Game Commission
PETITION TO THE CALIFORNIA FISH AND GAME COMMISSION FOR REGULATION CHANGE
FGC 1 (NEW 10/23/14) Page 1 of 3

Tracking Number: (2016-008)

To request a change to regulations under the authority of the California Fish and Game Commission (Commission), you are required to submit this completed form to: California Fish and Game Commission, 1416 Ninth Street, Suite 1320, Sacramento, CA 95814 or via email to FGC@fgc.ca.gov. Note: This form is not intended for listing petitions for threatened or endangered species (see Section 670.1 of Title 14).

Incomplete forms will not be accepted. A petition is incomplete if it is not submitted on this form or fails to contain necessary information in each of the required categories listed on this form (Section I). A petition will be rejected if it does not pertain to issues under the Commission's authority. A petition may be denied if any petition requesting a functionally equivalent regulation change was considered within the previous 12 months and no information or data is being submitted beyond what was previously submitted. If you need help with this form, please contact Commission staff at (916) 653-4899 or FGC@fgc.ca.gov.

SECTION I: Required Information.

Please be succinct. Responses for Section I should not exceed five pages

1. **Person or organization requesting the change (Required)**
   Name of primary contact person: Pat Wright
   Address: 4515 Panorama Dr, La Mesa CA 91941
   Telephone number: 619-757-7426
   Email address: pat@pan.sdcoxmail.com

   family: mustela
   Mustela putorius furo

2. **Rulemaking Authority (Required) -** Reference to the statutory or constitutional authority of the Commission to take the action requested: Fish and Game Code 2118 → [illegible]
   ↳ banned species ↳ code 671

3. **Overview (Required) -** Summarize the proposed changes to regulations: Remove domestic ferrets from the list of prohibited wildlife

4. **Rationale (Required) -** Describe the problem and the reason for the proposed change: Domestic ferrets are legal in 48 states and the Fish and Game Commission has never been able to document any harm that ferrets have done elsewhere, or even the large number of illegal ferrets already in California has done. Previous requests on my part have resulted in "we don't have time for this" from Commissioners. .

SECTION II: Optional Information

5. **Date of Petition: 05-26-2016**

6. **Category of Proposed Change**
   ☐ Sport Fishing
   ☐ Commercial Fishing
   ☐ Hunting
   ☒ Other, please specify: Fish and Game Code 2118

7. **The proposal is to:** (*To determine section number(s), see current year regulation booklet or https://govt.westlaw.com/calregs*)
☒ Amend Title 14 Section(s):§ 671. Importation, Transportation and Possession of Live Restricted Animals. (2) Class Mammalia-Mammals (K) Order Carnivora-Raccoons, Ringtailed Cats, Kinkajous, Coatis, Cacomistles, Weasels, Ferrets, Skunks, Polecats, Stoats, Mongoose, Civets, Wolves, Foxes, Coyotes, Lions, Tigers, Ocelots, Bobcats, Servals, Leopards, Jaguars, Cheetahs, Bears, etc.
☐ Add New Title 14 Section(s): Click here to enter text.
☐ Repeal Title 14 Section(s): Click here to enter text.

8. **If the proposal is related to a previously submitted petition that was rejected, specify the tracking number of the previously submitted petition** Click here to enter text.
Or ☒ Not applicable.

9. **Effective date**: If applicable, identify the desired effective date of the regulation.
If the proposed change requires immediate implementation, explain the nature of the emergency: Click here to enter text.

10. **Supporting documentation:** Identify and attach to the petition any information supporting the proposal including data, reports and other documents: **ANALYSIS OF THE POTENTIAL IMPACTS OF DOMESTICATED FERRETS UPON WILDLIFE, AGRICULTURE, AND HUMAN HEALTH IN NORTH AMERICA, WITH A FOCUS UPON CALIFORNIA, BASED UPON LITERATURE REVIEW AND SURVEY OF NORTH AMERICAN GOVERNMENTAL AGENCIES and jCEQA Environmental Checklist**

11. **Economic or Fiscal Impacts:** Identify any known impacts of the proposed regulation change on revenues to the California Department of Fish and Wildlife, individuals, businesses, jobs, other state agencies, local agencies, schools, or housing: Increased economic activity for the pet trade, decrease in Fish and Wildlife enforcement expenses.

12. **Forms:** If applicable, list any forms to be created, amended or repealed:
Click here to enter text.

SECTION 3: FGC Staff Only

Date received: May 26, 2016

FGC staff action:
☐ Accept - complete
☐ Reject - incomplete
☐ Reject - outside scope of FGC authority

Tracking Number

Date petitioner was notified of receipt of petition and pending action: _____

Meeting date for FGC consideration: ______________________

FGC action:

☐ Denied by FGC

☐ Denied - same as petition ____________________
Tracking Number

☐ Granted for consideration of regulation change

- allowing permits would have significant ecological repercussions to CA habitat/wildlife

CEQA Environmental Checklist

PROJECT DESCRIPTION AND BACKGROUND

Project Title:	Removal of domesticated European ferret (Mustela putorius furo) from the list of restricted animals under California Fish and Game Code §671
Lead agency name and address:	California Fish and Game Commission and/or California Department of Fish and Game, 1416 Ninth Street Sacramento, CA 95814
Contact person and phone number:	Pat Wright, 619-741-4439
Project Location:	Statewide
Project sponsor's name and address:	Pat Wright P.O. Box 3395 San Diego, CA 92163
General plan description:	Not Applicable
Zoning:	Not Applicable
Description of project: (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation.)	Legalization of the domesticated ferret is a regulatory action by the Fish and Game Commission to amend its regulations concerning the listing of the domesticated ferret as a restricted animal under Section 671 of the Fish and Game Code
Surrounding land uses and setting; briefly describe the project's surroundings:	Statewide
Other public agencies whose approval is required (e.g. permits, financial approval, or participation agreements):	None

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project. Please see the following checklist for additional information.

☐	Aesthetics	☐	Agriculture and Forestry	☐	Air Quality
☒	Biological Resources	☐	Cultural Resources	☐	Geology/Soils
☐	Greenhouse Gas Emissions	☐	Hazards and Hazardous Materials	☐	Hydrology/Water Quality
☒	Land Use/Planning	☐	Mineral Resources	☐	Noise
☐	Population/Housing	☐	Public Services	☐	Recreation
☐	Transportation/Traffic	☐	Utilities/Service Systems	☒	Mandatory Findings of Significance

CEQA Environmental Checklist

As a means of providing information related to any environmental assessment of the request to remove the domesticated ferret from the list of restricted animals under Section 671 of the California Fish and Game Code, the project proponent offers the following checklist to identify physical, biological, social and economic factors that might be affected by the proposed change in regulation. This checklist is modeled upon similar documents prepared by the California Department of Fish and Game for various proceedings. The checklist primarily reflects the findings of the study, "Analysis of the Potential Impacts of Domesticated Ferrets Upon Wildlife, Agriculture, and Human Health in North America, With a Focus Upon California, Based Upon Literature Review and Survey of North American Governmental Agencies," by Dr. G. O. Graening of Sacramento State University. Where there is a need for clarifying discussion, the discussion is included following the applicable section of the checklist or is within the body of the environmental document itself. The words "significant" and "significance" used throughout the following checklist are related to CEQA impacts. The questions in this form are intended to encourage the thoughtful assessment of impacts and do not represent thresholds of significance.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
I. AESTHETICS: Would the project:				
a) Have a substantial adverse effect on a scenic vista	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

DISCUSSION

a) Legalization of the domesticated ferret will not involve any construction or land alteration and thus will not affect scenic vistas.

b) Legalization of the domesticated ferret will not involve any construction or land alteration and thus will not damage scenic resources.

c) Legalization of the domesticated ferret will not involve any construction or land alteration and thus will not degrade the visual character of the site and its surroundings.

d) Legalization of the domesticated ferret will not involve any construction and thus will not create any new sources of light or glare.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
II. AGRICULTURE AND FOREST RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and the forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

DISCUSSION

The study upon which this checklist is based (Graening, et al., September 2010) discusses "issues" related to the potential effects on agricultural resources from legalization of the domesticated ferret (see Section 9, pgs. 90-94). However, under CEQA effects on livestock are not considered "impacts," but rather are economic effects, which would be included in a discussion of economic benefits and costs. Under CEQA, agricultural impacts are limited to actions or policies that have potential to lead to the conversion of prime farmlands to other uses. Therefore, legalization of the pet ferret will not create a significant impact to agricultural resources because it:

a) will not involve the conversion or modification of farmland;

b) will not conflict with existing agricultural zoning or any Williamson Act contracts; and,

c) will not involve any construction, land alteration, or land use changes and thus will not result in the conversion of Farmland to non-agricultural use.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
	☐	☐	☐	☒
III. AIR QUALITY: Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☒
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non- attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

DISCUSSION

a) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. Legalization of the domesticated ferret will not conflict with or obstruct implementation with the applicable air quality plan.

b) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes, and will not violate air quality standards or contribute substantially to any existing air quality violations.

c) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. Legalization of the domesticated ferret will not result in a cumulatively considerable net increase of any criteria pollutants for which the project region is non-attainment.

d) Legalization of the domesticated ferret will not release cumulatively considerable pollutants nor will it alter population distribution or patterns of human activity.

e) Legalization of the domesticated ferret will not release any odors or expose people to odor sources.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
IV. BIOLOGICAL RESOURCES: Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☒	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☒	☐	☐

Discussion

a) Domesticated ferrets are effectively incapable of survival in the wild, and ? based on what
therefore do not establish feral colonies that feed upon or harass listed species.
Domesticated ferret owners generally are well educated about their pets, and no
heed the advice of veterinarians and ferret advocacy groups to never let their no
pets outside off a leash. This advice is well founded, for many reasons:

- Unlike dogs and cats, ferrets recognize only the food they are given their first 6 months of life, and do not recognize insects, eggs, other mammals, or birds as food. They are completely reliant on humans for their survival.
- Ferrets suffer mortality from canine distemper and Rabies infection within days, and seldom if ever have time to infect other animals.
- They cannot survive extended periods above 80 degrees F.
- They are subject to predation from more than a dozen native and introduced species in California, including fox, coyote, mountain lion, bobcat, owl, hawk, falcon, eagle and feral dog.

The likelihood that domestic ferrets could survive long enough in the wild to inflict significant impacts upon listed species is extremely low, and is likely less than significant without mitigation. Domesticated ferret ownership is legal in 48 states, all of Canada, and all of Mexico, and millions of pet ferrets have been raised in captivity in the US since they were first brought to the continent in 1875. Yet no feral ferret population has ever been confirmed in the US.

However, a sustained effort to introduce the species into the wild, such as to control rabbits as was done in New Zealand, may have some probability of success in certain micro-ecosystems in California, where no predators to the ferret exist and where the climate and food availability are suitable and sufficient. The proponent knows of no such micro-ecosystem in California. Even the Channel Islands have populations of fox, golden and bald eagles, peregrine falcons and other predators that likely would ensure no feral ferret population could establish itself on any of the eight islands. However, the proponent would not oppose a ban on attempting to establish a wild population of domesticated ferrets, including a ban on transporting any domesticated ferret to any of the Channel Islands. With the condition that all domesticated ferrets in California be sterile and inoculated, and a ban on efforts to introduce the species in the wild, no significant impact to listed species will occur, nor will the action contribute to a cumulatively considerable impact to listed species.

b) As with a) above, legalization of the domesticated ferret is highly unlikely to have a substantial effect on riparian habitats and other sensitive natural communities. The domesticated ferret is essentially incapable of surviving anywhere in the wild, for the reasons cited above. With the condition that all domesticated ferrets in California be sterile and inoculated, and a ban on efforts to introduce the species in the wild, legalization of domesticated ferret ownership will not have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service.

c) Legalization of the domesticated ferret will have no physical effect on wetlands of any type. Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. It will not interfere with the movement of native fish and wildlife species or interfere with wildlife movement corridors.

d) Legalization of the domesticated ferret will not interfere with the movement of native fish and wildlife species or interfere with wildlife movement corridors.

e) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. It will not conflict with any local policies or ordinances protecting biological resources.

f) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. Other than the remote potential to introduce an exotic species, it will not conflict with the provisions of any approved local, regional, state, or federal habitat conservation plans. With the condition that all pet ferrets will be sterile and inoculated, and a ban on attempting to introduce a wild population, the potential for conflict with an approved habitat conservation plan is less than significant.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
V. CULTURAL RESOURCES: Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

DISCUSSION

Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. Therefore:

a) It will not affect any historical resources.

b) It will not affect archaeological resources.

c) It will not affect paleontological resources or unique geological features.

d) It will not disturb any human remains

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
VI. GEOLOGY AND SOILS: Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42?	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

DISCUSSION

Legalization of the domesticated ferret will not involve any construction or land alteration, and therefore:

a) It will not result in the increased exposure of people or structures to seismic and landslide risks.

b) It will not result in soil erosion or the loss of topsoil.

c) It will not result in an increased risk to people or property risk from any type of soil instability.

d) It will not create risks to life or property resulting from the movement of expansive soils.

e) No septic tanks or waste water disposal systems will be utilized or installed as part of the project.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
VIII. HAZARDS AND HAZARDOUS MATERIALS: Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

DISCUSSION

a-c) Legalization of the domesticated ferret will not involve the transport, use, or disposal of hazardous materials.

d) Legalization of the domesticated ferret will not be located on a hazardous material site.

e) Legalization of the domesticated ferret will not affect any airport use plan area.

f) Legalization of the domesticated ferret will not affect any airstrip.

g) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. It will thus not interfere with the implementation of emergency response or evacuation plans.

h) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. It will not expose people or structures to a significant risk of loss, injury, or death related to wildfire.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
IX. HYDROLOGY AND WATER QUALITY: Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☐	☒
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow	☐	☐	☐	☒

DISCUSSION

a) Legalization of the domesticated ferret will not involve any construction, land alteration, water use, or water discharge.

b) Legalization of the domesticated ferret will not involve any construction, land alteration, or groundwater use.

c) Legalization of the domesticated ferret will not involve any construction or land alteration, and thus will not alter drainage patterns in the project area.

d) Legalization of the domesticated ferret will not involve any construction or land alteration, and thus will not alter drainage patterns in the project area.

e) Legalization of the domesticated ferret will not involve any construction or land alteration, and thus will not have any impact on runoff within the project area.

f) Legalization of the domesticated ferret will not involve any construction or land alteration, and thus will not have any adverse impacts on water quality.

g) Legalization of the domesticated ferret will not involve any construction or land alteration. No new housing will be constructed.

h) Legalization of the domesticated ferret will not involve any construction or land alteration. No new structures will be associated with the project.

i) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. No people or structures will be exposed to new risks related to flooding as a result of the project.

j) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. The risks of inundation due to seiche, tsunami, or mudflow will not change as a result of the project.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
X. LAND USE AND PLANNING: Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☒	☐	☐
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☒	☐	☐

DISCUSSION

a) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. Thus, no established communities will be physically divided.

b) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. Other than the remote potential to introduce an exotic species, it will not conflict with the land use plans, policies, or regulations of the agencies with jurisdiction over the project. With the condition that all pet ferrets will be sterile and inoculated, and a ban on attempting to introduce wild populations, the potential for conflict with land use plans, policies, or regulations of the agencies with jurisdiction over the project is less than significant.

c) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. Other than the remote potential to introduce an exotic species, it will not conflict with the provisions of any habitat conservation plans or natural community conservation plans. With the condition that all pet ferrets will be sterile and inoculated, and a ban on attempting to introduce wild populations, the potential for conflict with habitat conservation plans or natural community conservation plans is less than significant.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XI. MINERAL RESOURCES: Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

DISCUSSION

a) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. Mineral resources will not be affected by the project.

b) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. Mineral resources will not be affected by the project.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XII. NOISE: Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

DISCUSSION

a) Legalization of the domesticated ferret will not involve construction or physical alteration of land, and its implementation will not involve the generation of noise levels in excess of agency standards.

b) Implementation of the project will not result in groundborne vibration or substantial groundborne noise levels.

c) Legalization of the domesticated ferret will not involve construction or physical alteration of land, or the creation of any permanent noise sources.

d) Legalization of the domesticated ferret will not involve construction or physical alteration of land, or substantially increase temporary or periodic ambient noise levels above levels existing without the project.

e) Legalization of the domesticated ferret will have no effect on noise levels within an airport use plan area or within two miles of a public airport or public use airport.

f) Legalization of the domesticated ferret will have no effect on noise levels within the vicinity of a private airstrip

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XIII. POPULATION AND HOUSING: Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

DISCUSSION

a) Legalization of the domesticated ferret will not involve any construction, land alteration, or the creation of new infrastructure. It will not induce population growth in or adjacent to the project area.

b) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. No existing housing units will be displaced or affected.

c) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. No residents of the project area or its vicinity will be displaced by the project

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XIV. PUBLIC SERVICES:				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☐	☒
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

DISCUSSION

a) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. Public services will not be affected.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XV. RECREATION:				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

DISCUSSION

a) Legalization of the domesticated ferret will not involve any construction, land alteration, land use changes, or population changes. The use of existing parks and recreation facilities within or adjacent to the project area will not be affected.

b) Legalization of the domesticated ferret will not involve any construction, land alteration, or land use changes. No recreational facilities will be utilized or constructed as a result of the project.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XVI. TRANSPORTATION/TRAFFIC: Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☐	☒
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Result in inadequate parking capacity?	☐	☐	☐	☒
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

DISCUSSION

a) Legalization of the domesticated ferret will not involve any construction, land alteration, land use changes, or population changes.

b) Legalization of the domesticated ferret will not involve any construction, land alteration, land use changes, or population changes. Its implementation will not result in traffic service level standards being exceeded.

c) Legalization of the domesticated ferret will have no effect on air traffic patterns.

d) Legalization of the domesticated ferret will not involve any construction or land alteration, including road construction. Legalization of the domesticated ferret will not affect or increase traffic and road hazards.

e) Legalization of the domesticated ferret will not involve any construction or land alteration. Emergency access will not be affected by the project.

f) Legalization of the domesticated ferret will have no effect on parking capacity.

g) Legalization of the domesticated ferret will not involve any construction or land alteration, and will occur on rural timberland. It will not conflict with adopted policies, plans, or programs supporting alternative transportation

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XVII. UTILITIES AND SERVICE SYSTEMS: Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

DISCUSSION

a) Legalization of the domesticated ferret will not involve any construction or land alteration. Wastewater treatment requirements will not be exceeded.

b) Legalization of the domesticated ferret will not involve any construction or land alteration, including the construction or expansion or water or wastewater treatment facilities.

c) Legalization of the domesticated ferret will not involve any construction, land alteration, or the creation of new infrastructure. No storm water drainage facilities will be constructed or expanded as a result of the project.

d) Legalization of the domesticated ferret will not involve any construction, land alteration, or the creation of new infrastructure. No new or expanded water supply entitlements will be needed in order to implement the project.

e) Legalization of the domesticated ferret will not involve any construction, land alteration, or the creation of new infrastructure. No wastewater will be produced as a result of the project.

f) Legalization of the domesticated ferret will not involve any construction, land alteration, or the creation of new infrastructure. No solid waste will be produced as a result of the project.

g) Legalization of the domesticated ferret will not involve any construction, land alteration, or the creation of new infrastructure.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XVIII. MANDATORY FINDINGS OF SIGNIFICANCE				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☒	☐	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

DISCUSSION

a) Removal of the domesticated ferret from the list of restricted animals in the California Fish and Game Code will have no impact in all but two areas examined above: biological resources, and land use planning. Because of the factors listed in the discussion of impacts to biological resources above, legalization of the pet ferret has extremely little potential to cause a wildlife population to fall below sustainable levels, to threaten to eliminate an animal community, or to reduce the number or restrict the range of a rare or endangered plant. Because they are effectively unable to survive in the wild, these potential impacts are likely less than significant, even without mitigation. However, mandating that all ferrets sold or placed from rescue operations in California be sterile and appropriately inoculated, and that no attempt be made to introduce the domesticated ferret to the wild, will further reduce the potential for significant impact, and assure any impact will be less than significant.

b) Legalization of ownership of the domesticated ferret has some potential to contribute to ongoing cumulative significant adverse effects to endangered or threatened species caused by development, agricultural activities, legal pet ownership and other activities and factors. Because domesticated ferrets are effectively unable to survive in the wild, legalization of the domesticated ferret in California is not likely to contribute to a cumulatively considerable impact to threatened or endangered species, even without mitigation. However, mandating that all ferrets sold or placed from rescue operations in California be sterile and appropriately inoculated, and that no attempt be made to introduce the domesticated ferret to the wild, will assure that legalization of the domesticated ferret will not contribute to a cumulatively considerable impact to listed species.

c) Legalization of pet ferret ownership in California is highly unlikely to create substantial adverse effects on human beings, especially when compared to the health and safety effects of legal dog and cat ownership. For instance, dogs are 200 times more likely to attack a human than ferrets, resulting in more than 300 deaths per year in the US alone. Ferrets can and do attack humans under certain circumstances, but only two deaths from domesticated ferret attacks have ever been confirmed in the US, and both of those involved infants being left unsupervised with the animals. Dogs and cats also are responsible for transmitting rabies to humans, causing more than 33,000 deaths per year worldwide. By contrast, only a handful of rabies cases have ever been confirmed in the domesticated ferret (22 since 1958), and no ferret to human transmission has ever been confirmed. With effective education by pet stores and rescue operations to warn owners of the potential dangers of domesticated ferret ownership, including instructions to never leave any ferret alone with an infant or small child, and with a condition that all pet ferrets sold or placed from rescue operations be appropriately inoculated, legalization of the pet ferret has no potential to create substantial adverse effects on human beings.

ANALYSIS OF THE POTENTIAL IMPACTS OF DOMESTICATED FERRETS UPON WILDLIFE, AGRICULTURE, AND HUMAN HEALTH IN NORTH AMERICA, WITH A FOCUS UPON CALIFORNIA, BASED UPON LITERATURE REVIEW AND SURVEY OF NORTH AMERICAN GOVERNMENTAL AGENCIES

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TABLE OF CONTENTS

DISCLAIMER

The statements made in the following report do not necessarily represent the views of the California Fish and Game Commission, the California Department of Fish and Game (CDFG), or California State University, Sacramento (CSUS). Any views or opinions expressed are solely those of the author. Nothing stated in this report should be construed as an attempt to offer or render a legal opinion, legal advice, or otherwise engage in the practice of law. Nothing stated in this report should be construed as an attempt to offer or render a medical opinion, medical advice, or otherwise engage in the practice of medicine.

ABSTRACT

This study attempted to fully summarize the body of knowledge on the domesticated European ferret (*Mustela putorius furo*) as it pertains to potential impacts upon the environment, particularly wildlife, agribusiness, and human health, via a thorough literature review and a survey of wildlife, agriculture, and health departments in the USA and Canada. Secondly, this study attempted to perform an impact analysis to identify potentially significant issues and any need for further analyses so that the California Fish and Game Commission could proceed with the preparation of an Environmental Impact Report (EIR), which is a necessary step in the consideration of citizens' petitions to alter the California Fish and Game Code so that ferrets can be imported and possessed legally in California.

A historical timeline of regulations and policies concerning ferrets in California was provided. The two basic paths to the legalization of ferrets (enacting legislation or changing State policy) were analyzed. Enacting legislation is the most immediate way to legalize ferrets in California, but requires significant amounts of money and public support that pro-ferret organizations have not yet obtained. This method does not require California Department of Fish and Game (CDFG) support or any environmental impact review process. To legalize ferrets in California by a policy change, CDFG concerns would need to be addressed and mitigated. CDFG is concerned with the cost of managing a regulatory program for ferrets, and CDFG would need assurance or proof that fertile ferrets, hybrids, or even polecats will not establish feral breeding populations and impact wildlife. Various strategies have been suggested to test whether or not ferrets could establish feral breeding populations and impact wildlife: analysis of case studies involving unconfined ferrets or polecats; performance of a controlled experiment or pilot study; or performance of a risk analysis or cost-benefit analysis. Some of the potential economic impacts of ferret legalization were discussed, and these impacts, both adverse and beneficial, may need to be analyzed further in the EIR.

Historically, the regulatory classification of ferrets was an important issue because the regulatory authority of some State agencies depended upon whether the animal was classified as wildlife/exotic animal or a domesticated animal/pet. With the advent of sterilization techniques and vaccines, most State agencies and non-governmental organizations now recognize the ferret as a pet or domesticated animal. There is little consensus among States as to ferret's regulatory status. At least 10 States have never regulated ferrets. Only California and Hawai'i ban ferret importation and possession. Many States and municipalities now regulate ferrets as a pet and require vaccinations. The great majority of States did not use an environmental impact review process during regulatory actions regarding the ferret.

The taxonomy and morphology of the ferret's genus *Mustela* is not definitive (*i.e.*, the genus is paraphyletic). *Mustela* is considered a Holarctic species complex that is unresolved due to hybridization. The taxon *Mustela putorius* is considered by many mammalogists to be a genotypic and phenotypic spectrum, with the wild polecat at one end and the domesticated ferret at the other end. The literature suggests that for several thousand years, humans have captively and selectively bred polecats to produce domesticated varieties, called *ferret*, that served as hunting companions, pets, or for rodent control. Since ferrets are often back-bred with polecats, each ferret lineage may be relatively ancient or modern, and may fall anywhere within the polecat-ferret spectrum in terms of its behavior and fitness. Cranial morphometrics are the only reliable way to differentiate polecats from ferrets and these taxonomic difficulties may pose a challenge to the regulation of ferrets. The ferret is widely distributed in Europe, and has been introduced far outside of its native range, especially New Zealand. The great majority of the published literature does not consider the ferret or polecat to be an established wild mammal in North America.

The enumeration of ferret populations, both as pet and laboratory subject, in USA and California is important for many reasons. No scientific census of ferrets has ever been performed in the USA; all existing estimates are based upon opinion or extrapolation of pet owner surveys or ferret product sales. Published estimates for total numbers of pet ferrets in the USA for the range from 275,000 to 10,000,000, and in California, range from 30,000 to 1,000,000.

The literature indicates that ferrets can and do escape confinement, and that accidental or intentional releases of ferrets into the environment do occur. It does not appear to be possible to completely eliminate the risk of a ferret escaping confinement in California. Ferrets have some, but not all, of the life history traits of an ideal invader species. The literature is divided on the issue of whether domesticated ferrets can revert to a feral condition and survive in the wild. The case studies of feral ferrets in New Zealand and other parts of the World demonstrate that mustelids within the polecat-ferret spectrum can establish breeding populations and adversely impact wildlife. It is not clear whether the American domesticated pet ferret can be directly compared to these feral populations, and whether they can be assigned the same risk of establishment and adverse impact upon the environment. All of the ideal conditions for establishment of a feral ferret population have not yet been met in California: a moderate climate, a superabundance of preferred prey, a community devoid of competitors and predators, and repeated introductions of large founding populations. Predation and competition from California's wildlife may be important factors that limit the success of the establishment of a feral ferret population.

Surveys of State agencies revealed a data deficiency in the enumeration of stray or feral exotic mustelids in the USA. A great majority of State agency personnel responded that there were not, or probably were not, any established feral ferret breeding populations in their States, and most State agencies responded that it was not considered important to assess the status of domesticated ferrets in the wild. Only California and Hawai'i agency personnel gave strong objections to the importation or possession of ferrets.

While sterilized ferrets have no potential to establish breeding populations, popular pet manuals indicate that the breeding of ferrets, and the ownership of hybrids, are desired by a portion of the pro-ferret community. With or without regulations, the State of California cannot completely prevent the importation of fertile ferrets, polecat-ferret hybrids, or polecats. Thus, some risk of feral breeding populations establishing in California still remains; no author or scientist has been able to convincingly enumerate this risk. Any ferret legalization action may need to assure CDFG that there is no possibility that hybrids or polecats are imported into California, or to demonstrate that hybrids and polecats do not pose a threat to the environment if they are released into the wild. The Commission may require adherence to its Miscellaneous Policies: Introduction Of Non-Native Species, which requires such assurances and demonstrations of no potential adverse effect upon wildlife. This potentially significant impact upon wildlife of the establishment of a feral breeding population of ferrets may need to be analyzed further in the EIR.

The literature documents that ferrets may have impacted European (residential) poultry production, especially in the late 19th and early 20th century. The literature is largely devoid of any instances of ferrets impacting agricultural resources in the USA, except for anectodal accounts. USA has, for the most part, phased out household poultry and egg production and now relies almost exclusively on commercial confined animal feeding operations; these facilities may be better protected from predators than traditional residential hen houses. Questionnaires of agricultural departments in the USA has not revealed any major impacts upon agribusiness resulting from ferrets, or any major opposition to ferret ownership; where agricultural agency personnel have responded negatively to ferret legalization/ownership, their concerns focused on the risk of ferrets biting humans or on the risk of ferrets establishing feral breeding populations, and not on the impact upon agricultural resources. This issue may not need to be analyzed further in the EIR.

The medical community and various State agencies have reversed their stance on rabies issues pertaining to ferrets, from emphatic statements in the 20th century that ferrets are not appropriate pets because of their proclivity to bite and the absence of an approved rabies vaccine, to neutral statements in the 21st century that ferrets should receive rabies vaccinations like other household pets. The Centers for Disease Control and Prevention stated that currently in the USA rabies is a rare disease and is relegated largely to non-pet vectors. The vaccination of ferrets for rabies (and canine distemper) could be made mandatory; public education and outreach could also be implemented. Provided that such

mitigation measures are incorporated into a legalization action, this potential impact upon human health could be reduced to a less-than significant level. This issue may not need to be analyzed further in the EIR.

Ferrets have a propensity to bite for various reasons. The frequency of ferret bites has not been demonstrated to be greater than the rates for dogs or cats, whose bite frequencies are considered to be acceptable risks that are outweighed by the benefits of their companionship. Serious ferret attacks appear to be rare and to be confined to infants and others who cannot defend themselves against a small animal. In most cases of serious attacks, the pet owners were not aware of the risks of leaving an unattended child near a ferret. Mitigation measures could include mandatory warning labels at points of sale, public outreach, and more radically, the ban of ferrets from homes with infants, elderly, or handicapped, and the euthanization of ferrets proven to cause serious injury. The CSUS questionnaire of health departments in the USA did not reveal any major opposition to ferret ownership; where agency personnel did comment, their concern focused on infants left unsupervised with ferrets. Provided that effective mitigation measures are incorporated into a legalization action, this potential impact upon human health and safety could be reduced to a less-than significant level. This issue may not need to be analyzed further in the EIR.

1. INTRODUCTION

The purpose of this study was first to summarize the body of knowledge on the domesticated European ferret as it pertains to its potential impacts upon the environment, and especially, native animals and ecosystems, agribusiness, and human health and safety. This study pertains specifically to the domesticated European pet ferret—*Mustela putorius furo* (hereafter, "ferret"), and not to its ancestors or conspecifics, the wild European polecat—*M. p. putorius* (hereafter, "polecat") and steppe polecat—*M. eversmanii*, and the North American black-footed ferret—*M. nigripes*. Consistent with the current zoological vocabulary, the use of the word "ferret" in this study indicates the domesticated variety of *M. putorius* bred primarily as a human companion or laboratory subject; the word "feral" refers to a domesticated animal that has reverted to its wild, ancestral condition, particularly in behavior, and usually implying reproduction in the wild (but not necessarily indicating a self-sustaining population); and the word "wild" implies an undomesticated, free-ranging animal whose behavior and genome has not been intentionally altered or influenced by humans.

The intent of this study is to provide the California Fish and Game Commission with adequate and unbiased information about ferrets so that the California Fish and Game Commission can proceed with the preparation of an Environmental Impact Report, which is required by both the California Environmental Quality Act and a statement made by California Governor Arnold Schwarzenegger. An Environmental Impact Report is a necessary next step in the consideration by the California Fish and Game Commission of petitions by citizens to reclassify ferrets in the California Fish and Game Code from their current standing as wild animals/pests to pets exempt from regulation under the Code.

The goals of this study were to:

- dispel myths / misinformation
- adequately summarize the published literature
- update the state agency questionnaire performed by Jurek and Ryan (1999)
- summarize the management of the ferret by other governmental agencies in North America
- Identify issues for further analysis in the future Environmental Impact Report

2. HISTORY OF REGULATIONS AND POLICIES IN CALIFORNIA

Historical timeline of regulations and policies concerning ferrets in California are presented next. The unpublished *Chronology of Selected Ferret Issues, Version 2003* by Ron Jurek (CDFG) was incorporated into this timeline.

- Before 1933, the State of California apparently did not regulate ferrets.

- August 1933. Wild bird and animal importation law (Chapter 76, Statutes of 1933) was enacted [unlawful to import or transport, unless permitted by Fish and Game Commission].

- December 1933. "Rules and Regulations Governing the Importation of Wild Birds and Animals" were adopted by the Fish and Game Commission and Department of Food and Agriculture [Commission absolutely prohibits importation of ferret and fitch].

- September 11, 1957. From 1957 legislation, the Fish and Game Code section relating to restricted species was renumbered from Sec. 1165 to Sec. 2116, and the opening sentence was revised, as follows: "As used in this chapter, wild animal means any...(of listed groups)...which is either is not normally domesticated; in the State or not normally native to the State."

- In 1974, the Fish and Game Code entitled *The Importation and Transportation of Live Wild Animals* was amended to include almost all members of Mustelidae (Herman 2000). Kizer and Constantine (1989) give the reason for regulation as:

- "Ferrets also develop feral populations and are especially destructive of poultry and small wild animals such as rabbits, which was the reason why the keeping of ferrets as pets was outlawed in California." (p. 466, Kizer and Constantine 1989).

- J. Hitchcock (of the California Department of Health Services) stated that the ferret has been banned since 1935 [sic] because of issues with wildlife, agriculture, and human health:
  "The European ferret (Mustela putorius) has been a prohibited species in California since 1935. Of all the vertebrates covered in Section 671, Subsection (c), of Title 14, California Administrative Code, Importation, Transportation and Possession of Wild Animals; the European Ferret {Mustela putorius) is the ONLY animal of vital interest to all three California Departments involved with Title 14, Section 671, i.e., California Department of Food and Agriculture, California Department of Fish and Game, and the California Department of Health Services. The European ferret's predacious nature and wanton destruction of poultry, rabbits and other small livestock is well documented, as is its disastrous effects on game birds, waterfowl and other wildlife. However, the recent numerous and widespread reports of vicious unprovoked attacks on infants, including several deaths, has brought the public health aspects of the European ferret into extremely sharp focus. This coupled with the increasing reports of rabid European ferrets adds even greater public health importance to the species." (p. 208, Hitchcock 1994)

- January 1, 1975. From 1974 legislation, Fish and Game Code Section 2116 was amended. A portion of the meaning of "wild animal" was revised, as follows: "...which either is not normally domesticated in this State or not normally native to this State as determined by the Commission." [the 1933 statute stated: "...which is either not normally domesticated, or not normally native within this State."]

- January 24, 1975. The opening sentence of Section 671. Title 14, CAC, was revised, as follows: "The following species of the families which are prohibited or for which a permit is required are determine to be not normally domesticated in the state and shall not be imported into, transported within; or possessed in this state, and permits for their entry..." Section 671.2, regarding Neutered Male Animals, was amended for allowing DFG to permit entry of neutered male animals not otherwise admissible, provided the application was accompanied by certification of neutering.

- 1976. The Commission adopted regulations that prohibited the issuance of permits for ferrets, except that permits could be issued for neutered male ferrets, for exhibition in zoos, for use in scientific or public health research by scientific institutions, and for public display or for exhibition in motion pictures and television.

- Late 1970s. Department of Food and Agriculture border check stations began detecting illegally imported ferrets.

- February 1, 1980. The number of requests received by the Commission to possess ferrets in California was increasing significantly. In testimony before the Commission, the Department reported that there were numerous un-neutered ferrets in the possession of people in California. Regulations provided for the importation of neutered male ferrets. However, there was no provision for importation of neutered female ferrets, so the Department was asked to develop a proposal to resolve the matter.

- March 7, 1980. The Department presented its proposal regarding importation and possession of female ferrets. The Commission approved the issuance by the Department of permits to possess female ferrets in California, if they were verified as having been acquired prior to Mar. 7, 1980 and as having been neutered and marked. Following a 60-day moratorium on arrests, future requests for importation or possession of female ferrets would be denied. Also, the Commission denied a request for permits to import ferrets for sale.
- July 12, 1982. Department law enforcement reported that a significant increase was noted in numbers of ferrets intercepted at Agricultural Inspection Station. Also, numbers of people found to be illegally breeding ferrets in California was increasing. Two wardens were assaulted in a case involving illegal ferret breeding.

- July 12, 1982. The Department of Fish and Game established policy to deny issuance of permits to California residents to import and possess neutered males of prohibited animals, including ferrets. Such permits would be issued only to persons moving to California who already possessed such pets. This policy was made at the request of the California Department of Food and Agriculture.

- September 30, 1985. Department of Food and Agriculture position letter recommended "*No change in present regulations*" restricting ferrets.

- October 4, 1985. Department of Health Services' position letter requesting "*Don't relax or eliminate present restriction on ferrets.*"

- October 11, 1985. The Department informed the Commission of position statements by Department of Fish and Game, Department of Food and Agriculture, and Department of Health Services to continue restrictions on ferrets.

- November 1, 1985. The Commission approved a request for possession of two neutered female ferrets. Also, the Commission requested an in-depth analysis of potential problems associated with Commission authorization of ferrets for pet purposes.

- There was apparently a policy shift in 1986—1987 by CDFG:

  "Until 1987, sterilized male ferrets could be imported and possessed as pets, under DFG permit." (page 1 of Appendix B-1, Jurek and Ryan 1999)

- 1986. Beginning of intensive ferret legalization efforts in California by pro-ferret groups.

- February 2, 1986. The Department provided the requested analysis of potential problems associated with Commission authorization of ferrets for pet purposes.

- March 7, 1986. The Commission voted to uphold regulations restricting ferrets and supported strict enforcement.

- July 15, 1986. The Department announced its policy to deny all requests for permits for neutered male ferrets pending Commission consideration of a proposal to repeal 671.2, Title 14, California Administrative Code.

- October 7, 1986. Pre-publication of Notice to prohibit the importation and possession of neutered male animals not otherwise admissible.

- According to P. Weisser, an Information Officer for CDFG, amnesty was given to some ferrets in 1986 when the Commission adopted a new policy regarding ferrets:

  "Under a policy adopted in 1986 by the Fish and Game Commission, neutered male ferrets were made illegal as pets in California, except for those which were already pets at that time. Their owners were granted permits to keep the 'grandfathered' pet ferrets, but no new pet ferrets could be acquired in or brought into California." (p. 6, Weisser 1991)

  "The [California Domestic Ferret] association plans to seek legislation to legalize ferret pet ownership in California. According to Phillips, the idea is to seek creation of a permit to keep a ferret pet in California. The permit would be good for a three-year period and cost $50 for each pet ferret. Phillips stresses that, under the legislative proposal contemplated by the California Domestic Ferret Association, all pet ferrets would be required to be spayed or neutered. A separate permit would be required for ferret breeders and the cost of the permit would be several times that of a pet owner's permit. Assuming that 500,000 ferret pets already exist in California, such legislation could generate as much as a $5.5 million chunk of ferret-generated revenue for DFG's tight budget in an era of very limited state fiscal resources, Phillips suggested. Would this volume of revenue lead DFG policy makers and lawmakers to take a new and more sympathetic look at legalizing ferrets as pets? DFG enforcement officials say the existing ferret policy is sound and should not be influenced by a

revenue argument. The say the $50 permit fee contemplated would not cover the cost of inspecting facilities, responding to escaped ferrets and issuing permits. They also question why ferrets should be treated differently than other pet wild animals." (p. 9, Weisser 1991)

- January 1987. The Commission directed the Department to discontinue issuing permits to possess prohibited species for pet purposes, except for those who legally possessed such animals in California at that time.

- May 15, 1987. The Commission voted to repeal Section 671.2, Title 14, California Administrative Code, thereby prohibiting the importation, transportation, and possession of neutered males of restricted animals listed in Sec. 671, including ferrets

- February 10, 1988. Superior Court of California for San Diego County—*Gross v. State*—ruled as a matter law that section 2116 and 2118 of the Fish and Game Code and Section 671 of the California Administrative Code are constitutional and can be applied to restrict domestic ferrets.

- October 1988. Subsections (a) and (b) of Section 671, Title 14, were added: "(a) It shall be unlawful to import, transport, or possess alive animals restricted in subsection (c) below ..." and "(b) The commission has determined the below listed animals are not normally domesticated in this state." These and additional verbiage replaced "The following species of the families which are prohibited or for which a permit is required are determine to be not normally domesticated in the state and:.." The list continued to include the Family Mustelidae (all species).

- December 1988. Department of Health Services published an assessment of the hazard posed by ferrets to public health, small livestock, and wildlife. Information was obtained on 452 ferret attacks on people during 1978-1987, one hundred of which were in California.

- 1989. California Domestic Ferret Association lead ferret legalization efforts in the state (1989-1996).

- March 1989. The Department in southern California seized 36 illegally owned ferrets from six people, including two founders of the Southern California Ferret Association, who were suspected of trafficking and commercial breeding of prohibited wildlife. The following magazine article summarizes other enforcement actions in this year:
  "During 1988-89, 150 ferrets were taken from their owners at state borders by the pest exclusion division of the State Department of Food and Agriculture. 'They're one of the easiest animals to detect because they smell so bad—all you have to do is stick your nose into the car window,' says Fish and Game's Rich Barbour." (p. 27, Gustaitis and McGrath 1992)

- 1992. *California Domestic Ferret Association v. California Fish and Game Commission, et al.*

- 1993. Department of Fish and Game wardens in 1993 issued approximately 50 citations for possession of illegal ferrets, and approximately 60 ferrets were confiscated.

- January 1994. Assembly Bill 2497 (Goldsmith) was introduced to provide for legalization of ferrets. [failed passage 4/94]

- Former Assemblyman Jan Goldsmith, R-Poway, supported an amnesty measure in 1994 (Assembly Bill No. 2497):
  "Ferrets are also ingrained in state Capitol lore. Former Assemblyman Jan Goldsmith, R-Poway, drew a rousing rejoinder from former Assembly Speaker Willie Brown as he pitched a ferret amnesty measure in 1994. 'That bill is deader than that thing on your head,' quipped Brown, referring to Goldsmith's hairpiece." (Gardner 2004)

- Hitchcock (1994) described the same measure as follows:
  "In light of a recent California Legislature Assembly Bill (AB No. 2497) 'Wild animals: domestic ferrets' introduced by Assembly Member Goldsmith (coauthor Senator Kopp) on January 11, 1994; both the approach

and content of this presentation has been modified to meet a more urgent and critical need (Goldsmith and Kopp 1994). AB No. 2497 would allow 'domestic' ferrets 'to be owned as pets without a permit as long as the owner of a ferret maintains, and can produce documentation showing that the ferret has been vaccinated against rabies with a vaccine approved for use in ferrets by the United States Department of Agriculture and administered in accordance with the recommendations of the vaccine manufacturer.' The bill would amend Section 2118 of the Fish and Game Code in two locations: 1) under Order Carnivora 'All species, [prohibited] except domestic dogs (Canis familiaris) and domestic cats (Felis catus)' would be amended to strike the 'and' between dogs and cats and following (Felis catus) to add ', and domestic ferrets (Mustela furo) to be owned as pets, as long as the owner ...' as in the paragraph above; and 2) following the listing of mammalian orders in the final paragraph 'Mammals of the orders Primates, Edentata ... are restricted for the welfare of the animals, except for the families Viverridae and Mustelidae in the order Carnivora are restricted because such animals are undesirable and a menace to native wildlife, the agricultural interests of the state, or to the public health or safety' would be amended to add between animals and are undesirable ', not including domestic ferrets to be owned as pets,'. The European ferret is obviously a member of the Family Mustelidae! The bill would also amend Section 25990.3 [sic] of the Health and Safety Code which is currently a single, simple and easily interpreted paragraph. '25990.3. The state department shall publish from time to time a list of animals which may not be imported into this state except by permit from the state department. Unless such a permit is issued pursuant to the provisions of this chapter, it is unlawful to import into this state any wild animal for which a permit is required by the state department.' The amended Section 25990.3 would add a second paragraph: 'A permit shall not be required to import into this state domestic ferrets to be owned as pets, as long as the owner of a ferret maintains ... of the vaccine manufacturer' as AB No. 2497 above. There are also two minor changes in the original paragraph, the 'which' after 'list of animals' is changed to 'that' and 'the provisions of' is deleted."

- December 1994. Senate Bill SB 55 (Kopp), nearly identical to AB 2497, was introduced [failed passage 1/96]

- August 3, 1995. Presentation to the Commission by California Domestic Ferret Association requesting legalization of ferrets as pets

- November 2, 1995. Presentation to the Commission by California Domestic Ferret Association requesting legalization of ferrets as pets.

- Jurek and Ryan (1999) summarized an attempt in 1995 by the pro-ferret organization California Domestic Ferret Association to get the Commission to reclassify ferrets:

  "In 1995, the California Domestic Ferret Association publicly requested that the Commission remove the domestic ferret from the list of restricted 'wild animals' under Title 14, Section 671. At their November 2, 1995 meeting, the Commission voted to submit a notice of proposed regulatory action to the Office of Administrative Law to consider removing the ferret from that list. That regulatory process was to be initiated after a draft environmental document had been completed for public review. The Department of Fish and Game (Department) was asked by the Commission to prepare an environmental document. The Department responded at that time that the earliest staff could begin work on such a document would be in spring 1996. The Department's Wildlife Management Division reassigned endangered species staff time to this undertaking in May 1996. To establish the scope of the document, the Department focused on two main areas of information gathering. The first was a bibliographic search. The Department contracted with the University of California at Davis to conduct an extensive literature search of libraries, Internet sources, and other information sources. That bibliography was published as an administrative report in 1997 (Whisson and Moore, 1997). The other part of the scoping process entailed canvassing each state for pertinent information on their laws and regulations and on the status of the ferret. The goal was to determine the concerns of each state wildlife agency and to clarify what authority and role each state wildlife agency had regarding ferrets. Such information would be useful to the Department for preparing the environmental document for the Commission. A questionnaire was developed for this survey. In October 1996, the Wildlife Management Division of California Department of Fish and Game mailed the questionnaire to each state wildlife agency in

the nation. Meanwhile, the Office of the Attorney General had been conducting a legal analysis of the Commission's power to designate "wild animals" and limitations, if any, of adopted regulations. In November 1996, the State Deputy Attorney General informed the Commission that, in his opinion, the Commission did not have the authority to adopt regulations to remove restrictions on ferrets, so legalization of ferrets was a legislative matter. On November 8, 1996, the Commission accepted that decision and proposed to work with the California Legislature on legislation to provide guidance and clarification to the Commission. Therefore, with no pending Commission action, there was no longer a need for the environmental document. However, the nationwide survey information would be useful if future legislation or Commission actions include requirements for environmental documentation." (pp. 1-2, Jurek and Ryan 1999)

- The results of this nationwide survey were published in Jurek and Ryan (1999).

- November 2, 1995. The Commission voted to submit a notice of proposed regulatory action to consider removing the ferret from the list of prohibited species. The associated regulatory process would be initiated only after a draft environmental document were completed for public review.

- May 1996. H.R. 37 (Goldsmith) - House resolution "...Resolved, that the Fish and Game Commission should remove the domestic ferret from its list of unlawful wild animals and should no longer prohibit ownership or possession.."

- October 1996. Californians for Ferret Legalization formed to lead ferret legalization efforts in the state. until 2003.

- October 1996. The Department mailed a survey questionnaire to each state wildlife agency in the nation to obtain legal and natural history information regarding domestic ferrets. (Published August 1999)

- November 8, 1996. The State Deputy Attorney General informed the Commission that, in his opinion, the Commission did not have the authority to adopt regulations to remove restrictions on ferrets, so legalization of ferrets was a legislative matter. The Commission accepted that decision and proposed to work with the California Legislature on legislation to provide guidance and clarification to the Commission.

- December 1996. *Marshall Farms v. Commission*: Marshall Farms, New York, the largest ferret breeding facility in the U.S., sued the Fish and Game Commission on grounds that it had failed to fulfill its mandated statutory duty to reclassify the ferret. The Commission appealed an unfavorable finding in that case.

- January 1997. Pat Wright, leader of Ferrets Anonymous, was the defendant in a case brought by the City of San Diego against him in 1996 for attempting to conceal from health officials a ferret that had bitten a child (*People v. Wright*). The City prevailed. Mr. Wright used the case to challenge the constitutionality of Fish and Game Code Section 2118 (B), with regard to the inclusion of ferrets as a Wild Animal. On April 30, 1997 his constitutional challenge was rejected.

- February 1997. AB 409 (Machado) was introduced to give the Fish and Game Commission, with cooperating state agencies, sole authority to regulate the importation, transportation and possession of all "restricted" animals, including the ferret.

- February 1997. AB 363 (Goldsmith) was introduced to legalize ferrets. Failed passage in Senate Appropriations Committee in 1998.

- January 9, 1998. *Marshall Farms v. Commission*: The Superior Court granted the writ of mandate. Commission filed an appeal to the Superior Court judgment.

- July 1998. AB 409 failed passage.

- February 1999. Assembly Bill AB 854 (Cunneen) was introduced to legalize ferrets already possessed in California.

Senate Office of Floor Analysis:

AB 854 (Cunneen-R) Wild animals: domestic ferrets

Provides that any person who owns a domestic ferret on April 20, 1999, shall be deemed to own the ferret legally after January 1, 2000, if the owner, on or before July 1, 2000, is able to produce documentation showing that the ferret has been vaccinated against rabies and if the ferret is spayed or neutered. Requires the State Department of Fish and Game to conduct a study for submission to the Legislature and the Fish and Game Commission before April 1, 2001 to determine the current and potential impacts, if any, of ferrets on the environment, native wildlife, agriculture, and public health and safety, relative to other domesticated animals. Based on the report and other relevant information, requires the commission to make a determination whether to remove the ferret from the list of prohibited species. Authorizes a county to adopt an ordinance that provides for licensing requirements, enforcement methods, and other regulatory measures. (Died in Senate Appropriations Committee)

- Herman (2000) summarized the intent of Assembly Bill 854 as follows:

  "On February 24, 1999, California Assemblyman Jim Cunneen (R-San Jose) introduced Assembly Bill 854 (hereinafter AB 854), the latest legislative proposal to legalize possession of ferrets in California. AB 854 passed the Assembly on May 27, 1999, by a vote of seventy-three to nine, and, as of October 1999, was pending in the California Senate Appropriations Committee. AB 854 is not a full-legalization statute, but rather an amnesty for ferrets. This bill, which is tentatively designated as Fish and Game Code sections 2220 and 2221, would allow legal possession of ferrets present in California as of April 20, 1999, provided that their owners can produce documentation of rabies vaccination (with a USDA-approved vaccine) and spaying or neutering. The CDFG, CDHS, and the California Department of Food and Agriculture would be required to conduct a study to determine current and potential impacts of ferrets on California's environment, native wildlife, agriculture, and public health and safety. CDFG would then have to present the results to the Legislature and the Fish and Game Commission by April 1, 2001. The Legislature and Commission would then determine whether to remove the ferret from Fish and Game Code section 2118's list of prohibited wild animals. If AB 854 were enacted, it would be possible that ferrets currently owned in California might be safe from confiscation, but could not be replaced through importation if the section 2118 ban on importation remained in force. Therefore AB 854 is a half-measure at best, and can only be seen as a provisional measure to be taken before any legalization of ferret ownership and reclassification of ferrets as domestic animals could occur. Yet even this limited amnesty is under attack; a staff recommendation to the California Senate Appropriations Committee suggested that the amnesty program be deleted entirely, and that AB 854 should be limited to the CDFG study before any legalization of ferrets, no matter how narrow in scope, could occur. Nevertheless, AB 854's use of a study to determine detrimental effects, in conjunction with an amnesty, would be more beneficial to ferret owners and the state of California than a study without amnesty. A 1997 report analyzing a legislative proposal similar to AB 854 noted that 'this option would provide at least some assurance that impacts would be studied properly...while enabling ferret owners to have their pets vaccinated, spayed or neutered, and provided with other necessary and appropriate veterinary care.' Thus AB 854, although suffering from some flaws, would still be an improvement to the status quo." (p. 50, Herman 2000)

- September 1999. *Marshall Farms v. Commission*: The Appellate Court opinion rendered.

- February 3, 2000. Presentation to the Commission by Californians for Ferret Legalization that the Commission consider removing ferrets from the restricted species list. The hearing was continued to April 6, 2000

- April 6, 2000. The California Fish and Game Commission, As explained at the meeting, a regulatory action by the Commission is considered a project under the California Environmental Quality Act, which requires the preparation of an environmental document. Therefore, at the conclusion of public testimony, the Commission directed the Californians for Ferret Legalization, as project proponents, to fund the preparation of the environmental document to assess the potential impact to the environment of this proposed action. The Commission would not be in a position to again consider this matter until such environmental document were prepared.

- 2001. SB 1093 (Johannessen *et al.*) This bill would give amnesty to ferrets that were in California as of May 1, 2001, and if they were spayed, neutered and vaccinated. It required a study of possible impacts of ferrets on wildlife and people. The final version of the bill would have appropriated $250,000 from the General Fund to pay for an Environmental Impact Report. The bill lacked sufficient support to pass (August 2002).

- In 2001, Pat Wright (of San Diego Ferrets Anonymous), filed a lawsuit (Pat Wright vs. California Fish and Game Commission)against the California Fish and Game Commission over their April 6th decision. Back in April the Commission said they would not discuss ferret legalization further until ferret proponents paid for another study on the environmental impact of ferret legalization.

- June 2001 – court granted the Department of Fish and Game's request for summary judgment to throw out lawsuit. CDFG's motion for summary judgment for declaratory relief over the ferret ban was rejected. Judgment was entered against Appellant on July 1, 2002. The Notice of Appeal from the Judgment was filed by Appellants on August 16, 2002, appealing from the final judgment and order after final judgment. In January 2003, Wright's appeal was denied.

- September 10, 2002. AB 3055 signed into law; allowing California veterinarians and their employees to legally treat ferrets. It excludes veterinary facilities boarding ferrets if no veterinary care is required. Golden State Ferret Society summarizes:
  - "Prior to 1995, licensed veterinarians in the State of California were required by law to report to the Department of Fish & Game the names of any clients who brought a ferret into their clinic. Eventually the legislature acknowledged that veterinarians should not be liable to perform law enforcement duties and overturned the law... In the early 2000s a bill was passed making legal for vets to care for ferrets without fear of repercussions." (Golden State Ferret Society website, http://www.goldenstateferretsociety.org/pdfs/2008ferretvetlist.pdf)

- The following is an excerpt of the resulting law that went into effect in 2002:
  "Section 4826.2 is added to the Business and Professions Code, to read:
  4826.2. Notwithstanding any other provision of law, a veterinarian, registered veterinary technician, or an unregistered assistant working under the supervision of a veterinarian, may provide veterinary care and treatment for any animal restricted pursuant to Section 2118 of the Fish and Game Code. A veterinarian, registered veterinary technician, or an unregistered assistant working under the supervision of a veterinarian, may lawfully possess one or more of the animals only for the period of time that, in his or her judgment, veterinary care and treatment are necessary. No veterinarian, registered veterinary technician, or unregistered assistant working under the supervision of a veterinarian, has a duty to advise law enforcement if he or she becomes aware that one or more of the animals is possessed in the state. For the purposes of this section, 'veterinary care and treatment' does not include boarding when no veterinary care or treatment is required." (Legislation query at http://www.senate.ca.gov/)

- January 27, 2003. SB 89 (Alpert) introduced. This bill would have established amnesty for ferrets in the state and would have required the Department to undertake a ferret-permitting program to collect fees to fund the preparation of an Environmental Impact Report. In July 2003, the author idled the bill, and it could possibly be taken up again in 2004.

- In 2004, Senate Bill 89, sponsored by Senator Dede Alpert (D-San Diego), would have granted amnesty under limited conditions to ferrets already in California; it was vetoed by Governor Arnold Schwarzenegger on 29 Sept. 2004. Gardner (2004) gives the following details:
  - "The legislation, SB 89 by Sen. Dede Alpert, D-San Diego, would have granted amnesty under limited conditions to ferrets already in California. A $75 license fee would have been dedicated to a study of whether ferrets pose any danger...Under Alpert's bill, ferret owners would have paid $75 to register their pets. Of that, $50 would have gone toward funding an environmental impact report to determine whether ferrets are dangerous or should be treated like any other pet. The measure also would have required vaccinations, and

spaying or neutering. The amnesty period would have closed July 31....'I love ferrets. I co-starred with a ferret in 'Kindergarten Cop,' Schwarzenegger insisted in his veto message. 'However, this bill is too bureaucratic and it legalizes ferrets prior to conducting an environmental impact report.' " (excerpts from Gardner 2004)

- In 2005, California Fish and Game Commission adopted the following policy for the introduction of non-native species into California:

  "MISCELLANEOUS POLICIES
  INTRODUCTION OF NON-NATIVE SPECIES
  It is the policy of the Fish and Game Commission that:
  Proposals to introduce exotic species shall be submitted to the Commission for approval. The Department will review and evaluate proposals to insure that the potential effects of such introductions will not have unacceptable negative impacts on native species, agriculture interests, and public health and safety.
  In considering proposed introductions, the Commission and Department will be guided by the following:
  Introduction of exotic species will be authorized only after potential impacts have been carefully evaluated and it has been demonstrated that such impacts will be negligible or positive. Such an evaluation will consider the species' ability to disperse outside the introduction area.
  Initial experimental introduction of an approved exotic species will be made under conditions that will permit the action to be reversed, such as introduction into a confined area or introduction of sterile individuals.
  Benefits of the action will be described, including why the need cannot be satisfied through improved management to enhance native species or previously established non-native species.
  Introduction of previously established non-native species into areas of the state where they have not been established will be permitted only after it has been determined by the Department that they will have no significant negative impacts.
  Introduction of previously established non-native animal species shall be done in a manner consistent with Section 671.6 of Title 14.
  Stocking of "fish" into the waters of the State shall be done in a manner consistent with Section 238.5 of Title 14.
  Definitions:
  A non-native species is any of mammal, bird, fish, amphibian, reptile, invertebrate, or plant that is not native to California. A previously established non-native species is an animal or plant that has become established in California by the aid of humans.
  Amended: 06/23/05"
  (Available on the Internet at: http://www.fgc.ca.gov/policy/p4misc.asp#INTRODUCTION)

- Other recent attempts by pro-ferret organizations to get the California State government to reassess the ferret legalization issue include the following:

  "In an open letter to Secretary of Agriculture A.G. Kawamura, dated June 2nd, 2007, the non-profit organization, LegalizeFerrets.org, part of the San Diego chapter of Ferrets Anonymous, requested a formal re-evaluation of the statewide ban on domestic ferrets (Musteo [sic] putorius furo). 'The ban on ferrets as pets in California is has been justified on a single, 18-year-old study, for which no background information is available,' says Pat Wright, founder of Ferrets Anonymous and LegalizeFerrets.org. 'The study is outdated and flawed. Since no one at the agriculture department or the Department of Fish and Game can give us any scientific reasons why domestic ferrets threaten agriculture or the environment, we feel the ban should be overturned.' Wright characterizes his open letter to the California Department of Food and Agriculture (CDFA), the agency responsible for commissioning the 1989 study, as an invitation to examine the issue more closely, in the name of responsible government." (Tone 2007).

  "According to LegalizeFerrets.org, California ferret owners are upset that the head of the California Department of Food and Agriculture, the Honorable A.G. Kawamura has ignored a formal request and letter writing campaign to get the CDFA to reevaluate their position that ferrets pose a threat to the state's agricultural industries... In 1992 the CDFA commissioned a study by Kenneth Smallwood titled A Rating System for Potential Exotic Bird and Mammal Pests which listed the domestic ferret as highly likely to go

feral, and once feral difficult to eradicate. The problem with the study is the variables plugged into their matrix were subjective. The study starts with the conclusion and works backward. And 25 years later, despite California having more pet ferrets than any other state - (according to the Pet Industry Joint Advisory Council, the nation's leading pet industry lobby) not one ferret has ever damaged anything related to agriculture in the state of California. On June 2nd this year a registered letter was sent to Mr Kawamura by LegalizeFerrets.org founder Pat Wright asking: to request a formal re-evaluation of the ban on domestic ferrets (Mustela putorius furo) in this state. As the lead agency regarding information and information dissemination on the domestic ferret, the California Department of Food and Agriculture (CDFA) has a responsibility to all Californians to either justify the ban with specific scientific information or publicly declare that CDFA does not oppose ferret legalization. No response was received. LegalizeFerrets.org then conducted a letter writing campaign. We know of hundreds of letters went to Mr. Kawamura and no one received a response." (Zander 2007)

Currently, under Fish and Game Code §§12000, 12002, it is unlawful to import or possess certain wild animals in California; possession of wild animal specified by Fish and Game Code §2118 is a misdemeanor, punishable by imprisonment and/or a monetary fine. The animal must be destroyed or removed from California within 72 hours, at the owner's cost (Fish and Game Code §§2122, 2189). The authority to decide which animals are classified as "wild animals" resides with the Commission, according to Fish and Game Code §2116:

"§2116. Wild Animal

As used in this chapter, 'wild animal' means any animal of the class Aves (birds), class Mammalia (mammals), class Amphibia (frogs, toads, salamanders), class Osteichtyes [sic] (bony fishes), class Monorhina (lampreys), class Reptilia (reptiles), class Crustacea (crayfish), or class Gastropoda (slugs, snails) which is not normally domesticated in this state as determined by the commission."

Fish and Game Code §2118 makes the ferret illegal to import or possess by virtue of not excluding it from the list, as is done for domestic dogs and cats:

"§2118. Unlawful To Import, Etc. Specified Animals; Exceptions

It is unlawful to import, transport, possess, or release alive into this state, except under a revocable, nontransferable permit as provided in this chapter and the regulations pertaining thereto, any wild animal of the following species:

(b) Class Mammalia

Order Carnivora (carnivores) All species, except domestic dogs (Canis familiaris) and domestic cats (Felis catus)."

A permit system is already in place to allow the importation and possession of restricted species—Fish and Game Code §671.1. Permits for Restricted Species. The application form is "2009 Restricted Species Application (FG1312)". However, the CDG current policy appears to be that no permits will be issued for ferrets (unless perhaps for scientific research).

Fish and Game Code §671 specifically lists the ferret in a list of restricted animals, making it illegal to import or possess ferrets in California, and designated them as "detrimental":

"§671. Importation, Transportation and Possession of Live Restricted Animals.

(a) It shall be unlawful to import, transport, or possess live animals restricted in subsection (c) below except under permit issued by the Department of Fish and Game.

(b) The commission has determined the below listed animals are not normally domesticated in this state.... Those species listed because they pose a threat to native wildlife, the agriculture interests of the state or to public health or safety are termed "detrimental animals" and are designated by the letter "D".

(2) Class Mammalia-Mammals

(K) Order Carnivora-Raccoons, Ringtailed Cats, Kinkajous, Coatis, Cacomistles, Weasels, Ferrets, Skunks, Polecats, Stoats, Mongoose, Civets, Wolves, Foxes, Coyotes, Lions, Tigers, Ocelots, Bobcats, Servals, Leopards, Jaguars, Cheetahs, Bears, etc.

5. Family Mustelidae - All species (D), except:

a. Ambloynx cinerea (Oriental small-clawed otter) (W).
b. Aonyx capensis (African clawless otter) (W).
c. Pteronura brasiliensis (Giant otter) (W).
d. All species of Genus Lutra (River otters) (W)."

The California Department of Public Health (CDPH) has the power to regulate ferret importation in California, but apparently does not currently consider the ferret a wild animal and does not prohibit importation. Provided here are excerpts of the Health and Safety Code §§121775-121845:

"§121775. As used in this chapter, "wild animal" refers to any animal of the class Aves (birds) or class Mammalia (mammals) that either is not normally domesticated in this state or not native to this state.

§121790. The department shall publish from time to time a list of animals that may not be imported into this state except by permit from the department. Unless a permit is issued pursuant to this chapter, it is unlawful to import into this state any wild animal for which a permit is required by the department.

§121795. The department may adopt regulations governing the entry, quarantine, or release from quarantine, of any and all wild animals imported into this state pursuant to this chapter. The regulations shall be designed to protect the public health against diseases known to occur in any such animals.

§121800. The violation of any provision of this chapter shall be a misdemeanor.

§121825. The department may issue a written permit to import into this state any wild animal specified by the department pursuant to Section 121790, upon determination that the public health and safety will not be endangered by the importation in accordance with the terms and conditions of the permit."

Section 30072 of the Health and Safety Code provides the aforementioned list of wildlife requiring a permit to import:

"§30072. Wildlife Admitted by Permit. No person shall import into or receive in this State any animals of the following orders, families, and genera specified herein without first obtaining a permit and paying to the Department such fees as required under these regulations.

§30072(b)(2)(d)
Family Musteldae [sic], genus Mephitis (Striped-Skunk and genus Spilogale (Spotted Skunk).
All other members of the family Musteldae [sic] are admissible without permit from the Department."

The CDPH website states the administration of these codes:

"Wild Animal Importation. Importers of specified carnivores and non-human primates into California are required to obtain a wild animal importation permit from the Veterinary Public Health Section (VPHS) prior to entry under authority of California Health and Safety Code sections 121775-121870 and California Code of Regulations, Title 17, sections 30070-30086. Additional restricted species permits may also be required by the California Department of Fish and Game.

Imported animals are mandated to be quarantined in approved facilities and be tested for certain infectious diseases prior to release of quarantine. Please refer to the wild animal importation laws and regulations for information about which animals require an importation permit and about the quarantine facility requirements. Applications for importation permits can be obtained by contacting VPHS."
(http://www.cdph.ca.gov/programs/vphs/Pages/WildAnimalImportation.aspx)

There is apparently only selective enforcement of violations of the Fish and Game Code regarding ferret importation and possession. Published examples include:

"Go ahead and snicker, but know that for many, the contraband status of ferrets is no laughing matter. If forced to choose, plenty of people would take their pets over their U.S. senators-they actually know their pets' names, they cost less to keep alive, and they perform their tricks closer to home. And know that as you chuckle, agricultural

agents on the state's borders are peering into cars looking for furry fellows. If spotted, the cars will be turned away. In an extreme case in 1995, a young man headed for summer school in California wound up in jail for attempting to bring his pet along. (His four-day sentence was cut down to a single day, when his jailers could no longer keep a straight face.)." (Lynch 2001)

"Enforcement of California's ferret exclusion rule is necessary. And while the ferret industry claims that hundreds of thousands of ferrets are already in California illegally, that claim has not been verified, although there is evidence that efforts to import ferrets into California have increased greatly in the past few years. Ferret interceptions at agricultural inspection stations increased steadily from none in fiscal year 1975-76 to 210 in 1985-86 (California Department of Food and Agriculture, 1987). Greater surveillance and enforcement efforts in this regard may be needed." (pp. 38-39, Constantine and Kizer 1988)

"...Department of Food and Agriculture border check stations began detecting illegally imported ferrets in 1976. By the late 1980s, statewide interceptions of vehicles containing ferrets had reached 150-300 vehicles per year (Calif. Dep. Food and Agric. records)." (p. 1, Jurek 1993)

"SAN DIEGO (AP) -- Ferret lovers say there may be 500,000 of the cute, weasel-like pets in California. And all of their owners are breaking the law... Owning a ferret, a misdemeanor, can carry a $1,000 fine and up to a year in jail. Ferret lovers say the law is rarely enforced." Associated Press. 1998. Ferret Rally in San Diego. Printed January 11, 1998

Current policy of the State of California is apparently to allow ferret-related products to be sold in pet stores without repercussion or penalty to the store owners, and without requiring these store owners to report the illegal possession of a ferret. The State of California also apparently tolerates the convening of ferret conferences and the posting of pro-ferret content on the Internet. Some pro-ferret organizations claim that all of these sources (veterinary visits, pet stores, pro-ferret conferences and correspondence) provide the State of California, and particularly CDFG game wardens, with ample information to persecute ferret owners and rudely enforce current anti-ferret regulations. The details of the enforcement of current anti-ferret regulations was not investigated in this study.

On 4 May 2009, Dr. Graening spoke with Counselor David Kiene (CDFG's Office of General Counsel); Mr. Kiene stated that the decision to remove an animal from the Section 671 list resided with the Fish and Game Commission, but that DFG would probably supply the scientific information to assist with that decision. David Kiene referred me to the Commission and specifically, to John Fisher.

On 5 May 2009, Jon K. Fischer (Deputy Executive Director-Regulations and Policy) spoke with Dr. Graening at length about the process to get the Commission to review the ferret's status on Section 671 list. First, Mr. Fisher stated that the Commission's position remained the same since the issue was brought up at the April 2000 meeting; that is, that an Environmental Impact Report (EIR) would need to be prepared before the Commission would make a decision on the ferret's status. Mr. Fisher stated that it was doubtful that the State would, or could, pay for such a report. Mr. Fisher pointed Dr. Graening to the Commission's policy on Non-native Animals, and stated that the Commission's policy was to make a decision based upon scientific evidence that the action (in this case allowing the importation and possession of ferrets) would have a neutral or beneficial impact upon the environment.

Dr. Graening proposed that CDFG's previous study be updated (Jurek and Ryan 1999). To remain unbiased, such a study could be performed by an academic institution and published in a peer-reviewed journal such as the Journal of Mammalogy. Mr. Fisher was enthusiastic about such an academic study, and stated that he thought that such a study would provide the information from which the Commission could make a decision. He did predict, however, that the results of such a study might not support the cause of ferret legalization.

Mr. Fisher did confirm that the decision to consider removing the ferret from the Restricted Animals list was a rulemaking action, and as such, would trigger the need for compliance with the California Environmental Quality Act; this is consistent with the Commission's prior insistence on the preparation of an EIR, as well as the statements made by the

Governor in 2004. Mr. Fisher did confirm that the Commission would probably be the Lead Agency (CDFG is the only other possible choice). Once the Final EIR was adopted and the Notice of Determination filed, the issue would be brought before the Commission for a vote. Mr. Fisher notified CDFG executive officers Sonke Mastrup and Dr. Eric Loft of the pending CSUS ferret impact study; Dr. Loft delegated the review of the ferret impact study to Dale Steele (Non-game Program). Quarterly progress reports have been mailed to Mr. Steele.

3. REGULATION OF FERRETS OUTSIDE OF CALIFORNIA

3.1. REGULATORY CLASSIFICATION

In the last 3 decades, the regulatory classification of ferrets was an important issue because the regulatory authority of some state agencies depended upon whether the animal was classified as wildlife/exotic animal or a domesticated animal/pet. Herman (2000) summarized the issue as follows:

> "A major split among the states concerns whether ferrets are considered wild or domestic animals. This status is of critical significance for tort liability: generally, an owner of wild animals is strictly liable for all the injuries they caused. On the other hand, owners of domestic animals, in the absence of statutes to the contrary, are strictly liable only for animals known to have a vicious disposition, and for farm animals (including horses, cattle, swine, goats, and chickens) that have trespassed onto others' lands. Several states' legislatures have explicitly defined ferrets as domestic animals, while others have classified ferrets as wild animals. Some states' courts have placed ferrets in the 'wild' category through judicial decisions. (p. 39, Herman 2000)

In Jurek and Ryan (1999)'s questionnaire, there was no consensus as to classifications:

> "Classification. State wildlife agencies use a variety of terms to classify ferrets under their regulations. Some states use more than one of the classifications described here. Five states reported that they used no such specific classifications. The most common classifications were 'domestic animal; and 'exotic', which were used alone or in combination with other classifications. Twenty-five (50%) of the states classified the ferret as a 'domestic animal'; five of those states classified them as 'exotic', as well. Sixteen states (32%) classified them as 'exotic'; five of these states also classified them as both 'exotic' and 'domestic animal', and two classified them as 'exotic' together with other classifications, including 'prohibited' and 'nongame' (Appendix B-5). Only one or two states each classify ferrets as 'nongame', 'furbearer', 'wild animal', 'restricted', 'non-protected', or other special designation." (p. 8, Jurek and Ryan 1999)

In our CSUS questionnaire, the results were slightly different:

> "Which of these terms are used in your State to classify domesticated ferrets under any regulations or codes?"
>
> Many respondents indicated that multiple classifications were used in their State.
>
> 'pet' or 'domestic animal' = AK, AL, AZ, CO, CT, CT, DE, DE, GA, IA, IA, ID, IN, KS, KY(2), LA, MD, ME, MT, ND, NE, NM, OK, OR, PA, RI, SC, SD, TN, VT, WA, WA, WA, WI
>
> 'restricted animal' = California, and Hawai'i ("since 1905")
>
> 'wildlife' or 'wild animal' = AR, GA, IL, MN, NB, NS, NV, VI, WY,
>
> 'exotic animal' = DC, NJ, TN, VI, WA, WI(2)
>
> 'nuisance animal' = WI
>
> indicated no classification = OH, OK, MN, NH, WV
>
> The rest of the respondents did not respond to this survey question.

Thus, since the Jurek and Ryan (1999) survey, there has been a slight increase in the number of States (25 to 29) that classify the ferret as a domestic animal and/or pet. Note that the classification of ferrets in a State is typically consistent with its regulatory status in that State. Those agencies that regulate the ferret as a pet, or do not regulate ferrets at all, tend to classify the ferret as a domestic animal and/or pet. Those agencies that regulate the ferret as a non-domestic animal or as a non-pet tend to classify the ferret as an exotic or wild animal, or in some cases, a nuisance animal.

With the advent of sterilization techniques and vaccines, many organizations now consider the pet, whereas previously, it was considered an exotic, wild animal. For example, the Humane Society of the United States (HSUS) has apparently reversed their position on ferrets from a classification of "captive wildlife" to "pet" (see HSUS 2010).

The classifications used by federal agencies was not explored in detail, but the USDA (2006) considers ferrets as domestic animals, as suggested by this excerpt: "*...Domestic ferrets are commonly kept as pets in the United States...*" Governmental agencies below the State level were not thoroughly researched. However, some States reported that municipalities regulated ferrets. For example, New York City has banned the ownership of ferrets, even though the State of New York has not. NYCFerrets.com describes the ban as follows:

> "How The Ferret Ban Started. On June 29th, 1999, the New York City Board of Health voted unanimously at its quarterly meeting to establish a list of animals to prohibit as pets in New York City. The list voted on includes ferrets which are now banned as pets in New York City's five boroughs under New York City Health Code Section 161.01. Although the Department of Health is not actively seeking out ferret owners, ferrets found in New York City's five boroughs may be confiscated and turned over to the Center for Animal Control. For many years, the New York City Board of Health has maintained that "Dangerous wild animals naturally inclined to do harm" were prohibited in New York City's five boroughs. The Board of Health also maintained that ferrets fell into that category of "Dangerous wild animals..." However, since ferrets are domesticated -not wild, and since they are neither dangerous nor naturally inclined to do harm, the ban -worded as such- did not apply to ferrets. Ferrets are legal in New York State, and although it is illegal to sell ferrets in NYC, there was no written law anywhere prohibiting their possession inside of New York City. Since the NYC Department of Health was unable to enforce the "Dangerous wild animal..." ban as it applied to ferrets, the Board of Health decided to amend the health code to include a specific list of animals of their own choosing to ban in New York City. Ferrets are included in that list." (NYCFerrets.com website, http://www.nycferrets.com/, accessed June 2010).

In several municipalities in North America, ferret possession is illegal (called "Ferret- Free Zones"), even if the State does not prohibit ownership (see Katie Redshoes, 2001, List of Ferret-Free Zones, http://pweb.netcom.com/~redshoes/ffz.html).

3.1.1. Summary and Opinion

In the last 3 decades, the regulatory classification of ferrets was an important issue because the regulatory authority of some state agencies depended upon whether the animal was classified as wildlife/exotic animal or a domesticated animal/pet. With the advent of sterilization techniques and vaccines, most state agencies and non-governmental organizations now recognize the ferret as a pet or domesticated animal. The classification of the ferret in a particular State or municipality is often dictated by its regulatory status. The great majority of State agencies classify it as a pet or domestic animal.

3.2. PROHIBITIONS ON IMPORTATION OR POSSESSION

It is incorrect to state that most States have legalized ferret ownership. For example, Herman (2000) makes the following claim:

> "To date, every American state except California and Hawaii has legalized ferret ownership; many states have done so just in the last decade" (p. 39, Herman 2000)

This statement suggests that most States have reversed previous regulations banning ferret ownership. Instead, the Ryan and Jurek (1999) questionnaire and our CSUS questionnaire indicate that many states simply do not regulate ferrets. While the differences in statements may be minor, pro-ferret groups are eager to suggest that there is almost unanimous consensus and increasing momentum among state agencies to legalize and support ferret ownership. Our literature review

and questionnaire did not support this opinion. There are exceptions, such as recent ferret bans in New York City and country-wide in New Zealand. It may be more accurate to say that many state agencies have recently begun to regulate the ferret as they do cats and dogs, and many new statutes have been created to require vaccinations and sterilizations. Schilling (2007) states:

> "Some cities and states require that owners obtain licenses or permits for their ferrets. A license can be free (such as in my state of Illinois), or it can cost as much as $100 per year. In some places, fees are per ferret..." (p. 39, Schilling 2007)

Reproduced verbatim here is summary of the Jurek and Ryan (1999) questionnaire on this subject:

> "History of State Legalization. According to these responses, ferrets have never been prohibited by state law in 36 states (72%). In one of these, Ohio, ferrets are not prohibited except for use in sport hunting. Of 14 states with a history of having had prohibitions, eight reported that legalization has since occurred, all within the period 1985-1995. In 1985, a court decision in Alaska resulted in removal of that state's authority to prohibit ferret ownership. From 1987 through 1995, seven more states legalized ferret ownership. This was done by state legislation in six states and by state wildlife agency action in one (Utah)...In six states, ferrets are prohibited, except under certain conditions (see Classification). Permits are required for possession as pets or for breeding in Kentucky, New Jersey, New York, and Rhode Island. In California and Hawaii, importation and possession for pet keeping or breeding are illegal, as no permits are issued (see Classification)." (pp. 4-5, Jurek and Ryan 1999).
>
> "Prohibition on Release of Ferrets. Asked whether the state has regulations that clearly prohibit the release of ferrets from captivity, 23 states (46%) responded 'Yes', and 27 (54%) responded 'No'. (p. 12, Jurek and Ryan 1999).

Based upon the CSUS questionnaire results, only two States in the USA prohibit the possession of ferrets—California and Hawai'i—this represents no change since the Jurek and Ryan (1999) survey. Some States allow possession only with proof of vaccination or with the purchase of a permit. The following US States have apparently never regulated ferrets: AZ, CO, ID, LA, MN, MO, MT, OR, TN, TX, WA, WV, WI, WY; this statement is based upon CSUS questionnaire responses and has not been substantiated by an exhaustive search of State legislative and policy documents.

When responding to the CSUS questionnaire, Keevin Minami (Land Vertebrate Specialist, Hawai'i Department of Agriculture) wrote the following cover letter:

> "Aloha Dr. Graening:
>
> Thank you for allowing the Hawai'i Department of Agriculture (HDOA) to participate in your survey regarding issues surrounding Domestic Ferrets (Mustela putorius furo) in Hawaii. The Plant Quarantine Branch of the Hawai'i Department of Agriculture regulates the importation of all non-domestic animals into the State of Hawai'i by referring to various lists of allowable animals that are maintained by the Board of Agriculture. The Ferret falls within the Department's List of Restricted Animals (Part A). Pursuant to Hawai'i Administrative Rules for the Department of Agriculture, Division of Plant Industry, Chapter 4-71 entitled "Non-Domestic Animal and Microorganism Import Rules", the import and possession of animals on this list is only allowed as follows:
>
> > 'Animals on Part A of the list of restricted animals, for research by universities or government agencies, exhibition in municipal zoos or government-affiliated aquariums, for other institutions for medical or scientific purposes as determined by the board'.
>
> Today, Hawai'i has the highest number of threatened and endangered bird species in the United States and with the added presence of Mongooses there are added pressures on these threatened and endangered bird colonies; allowing the Domesticated Ferret into Hawai'i will only increase those pressures and probably cause extinction, especially with ground nesting birds. As you may be aware Hawai'i benefits from the absence of rabies and another carnivore would only increase that possibility as well.

Sincerely,

Keevin K. Minami
Land Vertebrates Specialist
Plant Quarantine Branch, State of Hawai'i Department of Agriculture"

Tomich (1986) discusses the introduction of the Indian mongoose (*Herpestes auropunctatus*) into the Hawai'ian islands and its severe impacts upon native wildlife.

Many States prohibit use of ferrets for hunting; Jurek and Ryan (1999) reported that at least 22 States prohibit use of ferrets in sport hunting. An example of such a prohibition is found in the Indiana regulatory code (see http://ingov.chacha.com/search/query?query=ferret&sitesearch=http%3A%2F%2Fwww.IN.gov%2Fdnr&mode=ingov&searchwithguide=0. Conversely, some States still allow the use ferrets as hunting aids. The Colorado Division of Wildlife is an example, and the wildlife code is provided verbatim here:

"Colorado Division of Wildlife Regulations
CHAPTER 0 - GENERAL PROVISIONS
ARTICLE IV - MANNER OF TAKING WILDLIFE

A. Aids Used in Taking Big Game, Small Game and Furbearers - Except as expressly authorized by these regulations, the use of baits and other aids in taking big game, small game and furbearers is prohibited.

3. Other Aids

d. European ferret may be used as an aid in taking small game only in conjunction with hawking. All ferrets used in this activity must be neutered, permanently tattooed on the left inguinal area and dyed along one-fourth (1/4) of their body length for easy field identification."

(Published on the Internet at: http://wildlife.state.co.us/RulesRegs/Regulations/)

Some popular sources (e.g., Wikipedia 2010) state that Puerto Rico has banned ferrets; our investigation could not confirm this. We spoke to several staff members of the Puerto Rico Department of Agriculture by phone, and they knew of no regulations specific to the ferret.

Several States require proof of vaccination and/or a warning statement (regarding dangers to small children) at the time of purchase.

3.2.1. Summary and Opinion

There is little consensus among States as to their regulatory status. At least 10 States have never regulated ferrets. Only 2 States (California and Hawai'i) ban importation and possession. There is no indication that Hawai'i State agencies will reverse their stance in the near future. Many States and municipalities are now regulating ferrets as a pet similar to a dog or cat (especially the requirement of vaccinations).

3.3. ENVIRONMENTAL IMPACT REVIEW FOR REGULATION

In Jurek and Ryan (1999)'s survey, the questionnaire results did not indicate that any state agency prepared an environmental impact report during a ferret legalization action:

"Asked whether an environmental impact report, or equivalent, or a written evaluation was prepared for legalizing ferret ownership in the state, no state reported 'Yes', six (12%) reported 'No' (Georgia, Massachusetts, Pennsylvania, Utah, and Vermont), or 'No' and 'Not needed' (New Hampshire). One state (Michigan) responded 'Unknown'. The other states (43, or 86%) reported 'Not applicable'." (p. 14, Jurek and Ryan 1999).

The CSUS questionnaire produced slightly different results:

"Was an environmental impact statement, or other environmental assessment or written evaluation, prepared for legalizing domesticated ferret ownership in your state?"

'Yes' = DC, HI

'No' = AK, AL, AR, AZ, CA, CT(2), DE(2), GA, IA(2), ID, IL, IN, KS, KY(2), MA, MD, MI, MN(3), MT, NB, NC, ND, NE, NJ, NM, NS, NV, NY(2), OH, OK(2), OR, PA, RI, SC, SD, TN, VI, VT, WA(4), WI(2), WV, WY(2)

All other respondents did not respond to this survey question.

Thus, there has been a slight increase (from 0 to 2 States) in the last two decades since the last agency survey of the use of an environmental impact review during the regulation (or de-regulation) of ferrets.

3.3.1. Summary and Opinion

The great majority of States did not use an environmental impact review process during regulatory actions regarding the ferret.

3.4. REGULATIONS IN OTHER COUNTRIES

This study focused on North America. Wikipedia (2010) reviews some potential regulations of ferrets in other countries. The following references to regulations of ferrets in other countries were found:

> "In South Africa, the keeping of ferrets has been banned due to concerns that they might escape and naturalise (Pets4U, 2008)." (p. 10, Markula *et al.* 2009)

> "In New Zealand, ferrets are listed as an 'unwanted organism' under the Biosecurity Act 1993. Unwanted organisms are banned from sale, distribution and liberation throughout New Zealand. Ferrets are also declared as a 'pest' in many regional pest management strategies for which other restrictions apply and/or management actions are outlined. The list of specimens suitable for live import (as defined by the Environment Protection and Biodiversity Conservation Act 1999) does not list the ferret or the polecat. Hence, ferrets and polecats cannot be imported into Australia. Ferrets are a Class 1 declared pest animal in Queensland, as defined by the Queensland Land Protection (Pest and Stock Route Management) Act 2002. Only certain entities, such as zoos, can apply for permits to keep ferrets (pets are prohibited). Ferrets are illegal in the Northern Territory where they are listed as 'Prohibited Entrants' under the Territory Parks and Wildlife Conservation Act 2007. Ferrets are legal in all other states: a license is required in the ACT under the Nature Conservation Act 1980 (ACT Parliamentary Counsel, 2008) and a license may also be required in Victoria depending on local council laws. " (p. 10, Markula *et al.* 2009)

Schilling (2007) reports that ferreting is still a legal form of hunting in Australia and Europe.

4. STEPS TOWARD LEGALIZATION

The following statements should not be construed as legal counsel. There are two basic paths to the legalization of ferrets: enact legislation or change State policy.

4.1. ENACT LEGISLATION

Pro-ferret groups have apparently not succeeded in acquiring enough petition signatures to get a new ferret legalization bill/initiative/referendum directly on the ballot in California:

> "A recent poll paid for by a fundraising campaign directed by Pat Wright, founder of Ferrets Anonymous, found that only 38% of Californians prefer legalization of ferrets. As it turns out, gay marriage, at 43%, rates higher among those of the Golden State." Dan Reed. 2007. In California, gay marriage rates higher than legalizing ferrets. McClatchy- Tribune News Service. Washington. March 31, 2007. Pg. 1.

> "Now it's time to let the Governor know how Californians fell about ferret legalization. Make no mistake. This is NOT a ballot initiative. For those of you who do not know about that process, it takes one million dollars to gather the signatures needed to qualify. Why? Because those signatures need to be valid California voters and issues that

end up on the ballot are there because there was quite a bit of money behind them, enough to pay people to collect signatures. This issue doesn't have that kind of money." (Carley 2007)

Herman (2000) suggests the following:

"Assuming that AB 854—or some other bill with similar features—passes both houses of the California Legislature, the next question that arises is: How would future management of the ferret issue be handled?

Kenneth Umbach presents the best proposal in his report *Ferrets: A Selective Overview of Issues and Opinions*. Umbach proposes (in opposition to unrestricted ownership, continued prohibition, or an ownership-and-study proposal similar to AB 854) ownership with four requirements: (1) sale only through licensed breeders or animal welfare agencies, (2) vaccination against rabies and other animal diseases, (3) spaying or neutering before sale, and (4) a public education program to inform prospective ferret owners, and other pet owners, about the appropriate circumstances for ferret ownership.

Umbach's suggestions are reasonable and compatible with the concerns of the various California agencies. As noted earlier, vaccination is usually required for ownership of ferrets, and spaying and neutering are also required in some states. Limiting sales to licensed breeders and sellers would help to ensure compliance with animal control laws, particularly with regard to vaccination and spaying and neutering, as well as ensuring that prospective owners would obtain healthy, properly treated ferrets instead of sick and mistreated animals. The spaying and neutering requirements would sharply reduce the likelihood of feral colonies establishing themselves through the escape of unaltered ferrets capable of reproducing. A public education program could also protect pet owners—and their families—from making the mistake of buying animals that are unsuited to their households. After all, ferrets are not suitable for everyone, particularly for families with very young children (as is the case with other pets). Such a program could also persuade owners to properly care for their ferrets and reduce the chances of attack or escape.

California's hostile stance toward the ferret is more antiquated and unjustified than ever due to increasingly ferret-friendly legislation in other states, the development of an effective rabies vaccine, and statistical evidence indicating that ferret feral capabilities and destructiveness toward children and wildlife are exaggerated. As of 1999, California and Hawaii remain the only states that ban ferret ownership; many states not only allow ownership, but classify ferrets as domestic animals and not as wild animals. The few cases to address the issue, although negative, are limited by recent developments and studies, and by legislation reversing or limiting their holdings. Thus, California's classification of ferrets as "undesirable" wild animals should be reconsidered, and ultimately abandoned, to be replaced with qualified and restricted legalization and reclassification of ferrets as domestic animals under section 655 of the California Civil Code, whose ownership is protected by the California Constitution." (pp. 52-53, Herman 2000)

Various California legislators and agency personnel have criticized attempts to legalize ferret ownership through the legislative process because it bypasses the need for environmental impact review, which is required by CEQA for non-legislative decisions by State agencies.

4.1.2. Summary and Opinion

Enacting legislation is the most immediate way to legalize ferrets in California. This method does not require the support of CDFG and does not require CEQA compliance or any environmental impact review process. This method requires significant amounts of money and public support; pro-ferret organizations have not yet been successful in garnering enough public support to enact legislation.

4.2. CHANGE OF POLICY BY THE STATE OF CALIFORNIA

This report does not represent the official opinion of the State of California or CDFG.

To legalize the importation and possession of ferrets in California by a policy change, the most direct way is apparently to have the California Fish and Game Commission change the status of the ferret by a majority vote at a Commission

meeting, and then the Fish and Game Code §2118 would be changed to include the ferret as an exception to the wild animals regulated under §2116. The California Fish and Game Commission will probably require adherence to its 2005 policy document *Miscellaneous Policies: Introduction of Non-Native Species* before ferrets are legalized in California, which requires careful evaluation of the potential impacts of introduction, including the species' ability to disperse outside the introduction area, and an initial experimental introduction into a confined area, or the introduction only of sterile individuals (John Fisher, California Fish and Game Commission, pers. comm., 2009).

An impact analysis was performed by Umbach (1997) and discussed the policy options available to the Commission, and excerpts are provided here:

> "Selected Policy Options
>
> The following are options, not recommendations.
>
> No change—continued prohibition. Continue to prohibit domestic ferrets in California. One risk of this option is that the ferrets that are already kept as pets in California would be less likely to receive necessary and appropriate vaccinations and veterinary care than they would if permitted."
>
> End the prohibition without restriction or qualification. One risk of this option is the possibility of escaped or released ferrets becoming a nuisance or a hazard to wildlife.
>
> Permit ownership of pet domestic ferrets (Mustela putorius furo), with requirements that they (1) be provided only through licensed breeders/sellers (or through animal welfare agencies, such as local animal control departments and humane societies), (2) be vaccinated against rabies (and other diseases as may be appropriate as a public health concern), (3) be spayed or neutered before being sold or given to pet owners, and (4) be the subject of a public education campaign designed to assure that pet owners understand the circumstances under which ferrets are and are not appropriate pets. This option might reduce the risks of the previous option, but would involve potential costs of regulation, enforcement, and education.
>
> Permit ownership of pet domestic ferrets, with requirement for a subsequent formal study of impact on wildlife. This option was proposed in the April 15, 1997, hearing of the Assembly Water, Parks, and Wildlife Committee as an amendment to AB 363 (Goldsmith). Under this option, details yet to be announced, a formal scientific study would be commissioned for completion within five years of legalization of pet ferrets. The study would determine what impact on native wildlife, if any, had resulted from the change in the law through infiltration of escaped ferrets into natural settings. This option raises a possible concern that, if the study found detrimental effects, it would be too late or too difficult to correct them and disruptive to attempt at that time to again prohibit ownership of domestic ferrets in California. It is possible that legalization would lessen the care with which current (but illegal) ferret owners assure that their pets do not leave their homes, and that there might therefore be increased risk of predation by ferrets upon native wildlife or even establishment of feral colonies. On the other hand, this option would provide at least some assurance that impacts would be studied properly within a defined and reasonably near-term period while enabling ferret owners to have their pets vaccinated, spayed or neutered, and provided with other necessary and appropriate veterinary care, which is not currently available in California. Those who are confident, on the basis of existing data, that domestic ferrets do not pose a risk to native wildlife in California may favor the choice to legalize now, with the safeguard of follow-up study of impacts. Those who feel that the evidence indicates a demonstrated threat to native wildlife may prefer to study potential impacts more thoroughly before legalization in California. Such a prior study could take the form of (1) scientific testing of ferret survival capacities in California under controlled conditions, (2) systematic examination of evidence from other states and nations and preparation of an impartial and thorough report on the findings, or (3) both." (page 6, Umbach 1997)

4.2.1. Addressing Concerns and Objections Raised by CDFG

The following discussion is a summary of the inferred concerns and objections of CDFG based upon literature and file review, the review of the available internal agency correspondence, and personal interviews of CDFG staff.

The following CDFG concerns or issues would need to be addressed before they would support a change in policy or support a legislative bill:

- Compliance with CEQA. The Draft and Final Environmental Impact Report would need to demonstrate that any significant impacts can be mitigated to a less-than-significant level, or the Lead Agency (the Commission) would need to file a Statement of Overriding Considerations which determines that benefits to the public outweigh unmitigable environmental impacts.
- Assurance that ferrets will not establish feral breeding populations and impact wildlife, or the environment in general
- Procurement of funds to regulate ferrets, similar to that for cats and dogs, including the creation and maintenance of a license system, and to monitor compliance.

Even if the importation and possession of ferrets were to be condoned by CDFG, some restrictions would likely remain. CDFG is likely to require the following:

- Importation of only sterilized ferrets
- No breeding of ferrets in California
- No importation or possession of polecat-ferret hybrids or polecats
- Rabies and distemper vaccinations before a certain age
- Prohibition of ferrets on all of California's islands, which are sensitive to exotic mammal introductions
- Prohibition of release of ferrets into the wild

In the past, CDFG has not been convinced that ferrets will not establish feral breeding populations and impact wildlife, or the environment in general; recent correspondence with CDFG staff indicates that this position has not changed (Dale Steele, CDFG Non-game Program, pers. comm. 2010). If only sterilized ferrets were allowed to be imported and possessed in California, biological fact dictates that sterilized ferrets could not establish a breeding population. However, the issue focuses on the potential illegal importation of fertile ferrets or fertile hybrids or polecats in to California. After all, CDFG has not been able to stop the importation of hundreds of thousands of ferrets into California in the last 50 years while a full ban has been in effect. After legalization of ferrets, it is not out of the realm of possibility that Californians might wish to own a more rare, exotic, or charismatic mustelid, such as a polecat-ferret hybrid or polecat, as do the owners of wolf-dog hybrids.

Various strategies have been suggested to determine whether or not (fertile) ferrets could establish feral breeding populations and impact wildlife:

- Analysis of case studies involving unconfined ferrets or polecats in the USA and worldwide
- Performance of a controlled experiment or pilot study
- Performance of a risk analysis or cost-benefit analysis

We provide an analysis of case studies in Section 8. Following is a discussion of potential controlled experiments/pilot studies and risk analyses.

4.2.2. Performance of a Controlled Experiment or Pilot Study

A research study (*i.e.*, a controlled experiment or pilot study) could be performed that investigated the potential for pet ferrets to revert to a feral condition and survive in the wild; most authors envision fencing pet ferrets in large enclosures in the wild and determining if ferrets can survive and breed on the available wildlife and in various representative climates. Umbach (1997) suggested such a study:

> "How Could the Issue of Wildlife Impact be Tested?

Following are options for consideration. These are not intended as recommendations.

Wildlife biologists might be able to fit a number of ferrets with miniature transmitters and set them loose in a designated area to track their movements. If the ferrets do not survive, that would tend to support the view of the proponents. If they in fact attack wildlife or endanger habitat in the designated area and if they survive for a significant period, then that would be significant evidence against legalization. Alternatively, a number of ferrets could be set loose in secured areas (but not fitted with monitoring devices) and their survival and impacts observed over a period. Alternatively, and easier to accomplish, the Legislature could commission an extensive and impartial survey of states in which possession of ferrets is legal, conducted by an agency or organization, such as the California Research Bureau, that is not a party to the dispute over legalization, to determine what impacts have been observed. Such a survey could query academic experts, state wildlife officials, state and local chapters of wildlife organizations, veterinary organizations, and farm organizations." (pages 5-6, Umbach 1997)

In 1986, Eldrige Hunt (CDFG Wildlife Management Division Chief) wrote this opinion:

"In addition to the literature search that provided documentation of feral ferret populations, research investigations were considered and discussed with two prominent wildlife investigations experts. One was Dr. Lee Fitzhugh, U.C. Extension Wildlife Specialist, Davis, California. The other was Dr. Reg Barrett, U.C. Berkeley, Associate Professor, Wildlife Management. Both of these wildlife investigations authorities agreed that 1.) the laws should not be weakened in California that preclude the importation and possession of ferrets and 2.) a laboratory or field study to determine the ability of domestic ferrets to survive in the wild would be very difficult, take a long time and be plagued with escaping test animals. Dr. Fitzhugh suggested that a study might be feasible in some other state where ferrets are legal if enough money was available for a year or more study. He also suggested that a study is not necessary as a comprehensive literature search would probably do the job. Dr. Barret suggested a review of worldwide climates/habitat similarity that support known feral populations could be compared to California habitats. He also suggested that if people are truly concerned about the welfare of ferrets that they should direct funds and efforts into the reestablishment of our endangered black-footed ferrets in their former range." (pp. 2-3, Hunt 1986)

In the early 1990s, California Domestic Ferret Alliance apparently created a research proposal to determine whether or not (pet) ferrets could survive and breed in the wild. In 1993, Phil Nelms (Captain, CDFG Wildlife Protection Division), wrote an opinion letter, some excerpts here reproduced verbatim:

"If ferrets are no longer a threat to California's major poultry producers, nor pose a serious rabies risk to humans, I believe both the Department of Food and Agriculture (F&A) and Department of Health Services (DHS) may not be able to continue their support of prohibiting ferrets. The Department should maintain a position strongly supporting restriction of ferrets until we are CERTAIN they do not pose a threat to native wildlife. If they cannot survive/breed in the wild, I recommend total deregulation and acceptance of CDFA's proposal number one. In order to determine what threat ferrets pose to wildlife of California we should recommend:

- A three year Ph.D. study at University of California, Davis, or similar reputable institution, to determine the potential of ferrets to survive/breed in California. If CDFA is certain of their research, they should be willing to use funds they have available for litigation to fund the study.
- The study should include appropriate sites at the campus, in the foothills between Marysville and Grass Valley, at Hopland Deer Station, an appropriate coastal bylands site, and a site in Southern California.
- All parties, DFG, F&A, DHS, and CDFA, agree to base future regulations, or lack of same, on the results.
- If ferret's survive and breed—continue restriction. If they survive only, but do not breed—modify restriction accordingly. If they do not survive—deregulate completely at state level.

Nelms (1993)'s opinion letter also states:

"Popularity of ferrets as pets is not an important consideration in protecting California wildlife (except to provide some basis for our concern there are a lot of them 'out there' posing a great risk)....It is not important that we are one of only two to five states currently with a ban if our biology supports our regulation...California has thousands of square miles were temperatures rarely exceed 90 degrees...F&A may not continue support of restrictions based

on low threat to domestic poultry. If our biology is correct, the threat to wild-nesting native birds is sufficient to justify restriction without F&A support."

4.2.3. Performance of a Risk Analysis and/or Cost-Benefit Analysis

Another approach would be to use a predictive model to determine if ferrets had the potential to establish feral breeding populations in California, or to perform a cost-benefit analysis that weighed the relative costs of legalization (cost of licensing, regulating, and monitoring, any impacts to wildlife or environment, etc.) and the benefits of legalization (license program and pet industry revenue, any increases in numbers of vaccinated ferrets, etc.). A cost-benefit analysis is outside of the scope of this study.

In 1997, researchers from UC Davis submitted to Ron Jurek (CDFG) a draft research proposal whose goal was:

"...a combination of quantitative risk assessment, cost-benefit analysis, decision-tree analysis and geographic information systems can be used to develop a risk assessment process that can provide objective data for public policy decisions related to ferret legalization."

Their method description was stated as:

"Initially we will develop a geographic information system using habitat maps for California, and overlay distributions of known predators and threatened and endangered species in the state. This will define areas (and estimate the proportion of the state) in which survival and reproduction of ferrets would be likely to occur, and help evaluate potential impacts of ferrets on native wildlife. Probability distributions associated with survival and reproduction in these areas will be estimated. These probabilities will be derived empirically, whenever possible, but will likely require 'expert opinion'. Other empirically-derived probability estimates will be based on literature review and field surveys (including field work in the San Juan Islands). Methods for incorporating expert opinion in the analysis will follow recommendations of Vose (1993). All possible scenarios for establishment of wild populations will be evaluated. Current ferret numbers and their distribution will be assessed."

Bomford (1991) created a risk assessment model that employed a cost-benefit analysis to the decision of whether or not to allow introduction of an exotic vertebrate. Bomford and Hart (1998) elaborated on the cost-benefit analysis:

"The forms of adverse impact that an established population of an escaped exotic animal could cause include:

- reduction of agricultural productivity (competition with grazing stock for feed and water, damage to horticultural corps, predation on stock, land degradation)
- environmental damage (competition with native species for food, water, and shelter)
- spread of parasites or diseases
- attack, harassment, or annoyance threat to the community, particularly in the urban environment
- structural damage
- cost and collateral impact of control measures

The Benefit.

Exotic species can bring many benefits to agricultural production, recreation, tourism, scientific and medical research, international conservation efforts, and education. Many of Australia's agricultural and recreational industries are based on introduced animals and there is ongoing demand to import new species and genotypes." (p. 406, Bomford and Hart 1998)

"The key issues relating to assessing the risk of importing and keeping exotic vertebrates are:

- What is an acceptable level of risk relative to potential benefits for the import and keeping of exotic species?
- How can we minimize risk exposure (i.e., controlling the number and type of exotic species imported in the country) and manage the risk that we accept (i.e., management of the species that are introduced)?
- What criteria can be used to assess the potential costs and benefits of importing and keeping exotic species in Australia?"

(p. 407, Bomford and Hart 1998)

"Until 1991, VPC, Environment Australia, and AQIS had no framework or guidelines for assessing the risks associated with the import and keeping of potential vertebrate pest species in Australia. Risk assessments were made in a fairly subjective way and were difficult to justify if political pressure was brought to bear to alter a decision. Bomford's 1991 model was developed on the premise that the import and keeping of exotic vertebrates should be subjected to a balanced and rigorous risk assessment, taking into account both potential benefits and harmful impacts, and using all available scientific theory and information on the biology of the species being assessed. It should be emphasized that, given the uncertainty of the assessment due to incomplete information, it is a predictive model rather than an absolute measure of risk. Thus, a conservative approach should be adopted along the lines of the precautionary principle: 'the absence of evidence of risk does not equate to the evidence of an absence of risk' (Moller and Barret 1996). It is likely that community demands and international obligations under WTO agreements concerning free trade will result in increasing numbers of species being imported into and kept in Australia. Thus, there is a need to develop transparent, evidence-based risk assessment processes to increase decision-making objectivity and reduce the influence of social, economic, and political pressures. Risk assessment processes should be developed in conjunction with interest groups to achieve transparency and enhance compliance, although the assessment itself should be entirely independent of these groups. Interest groups should pay for the application of the risk assessment process in accordance with the user-pays principle (AQIS 1991)." (p. 407, Bomford and Hart 1998)

"The current risk assessment process.
Ecological theory relating to each of the component processes associated with exotic species introductions are considered by the current risk assessment model used in Australia. The component processes are the probability of:

- an exotic species escaping
- the escapees establishing a wild population
- the escapees or established population being eradicated
- harm associated with the three former factors outweighing the potential benefits associated with the species being imported."

(p. 407, Bomford and Hart 1998)

Forsyth *et al.* (2003) expanded upon Bomford and Hart (1998)'s work and refined their predictive model. Forsythe *et al.* (2003) developed this computer model to analyze the success or failure of vertebrate introductions into Australia. They determined that for both mammals and birds, species were more likely to successfully establish where they had wide climate tolerance or that the climate of their native range matched that of Australia, where they had been successfully introduced elsewhere, where more effort had been put into their introduction, and where the body size was small and reproduction rates fast. They concluded:

"Although the above factors have useful explanatory value, the outcome of any one introduction can remain difficult to explain. For example, the polecat-ferret (*Mustela putorius furo*) has a close climate match with Australia. Despite this, and the fact that it must have been deliberately and inadvertently introduced many times, this species has failed to become established. Releases of the species in Australia have mostly involved animals from the domestic end of the pole-cat spectrum, and it may be that domesticated forms are less likely to establish wild populations than undomesticated polecats. Releases in New Zealand, where the species has established a wild population, included polecats (Blandford 1987). Alternatively, factors unrelated to introduction effort and climatic suitability may be important. One possibility is that ferrets exhibit inappropriate antipredator behavior towards foxes and are quickly preyed upon (Georges 2000). The ferret has established widespread populations in New Zealand, where there are no larger predators." (p. 566, Forsyth *et al.* 2003)

Smallwood and Salmon (1992) provided a review of the literature on the impact of exotic species upon native wildlife. They then created a rating system and applied it to species of concern in California; an excerpt is provided:

"A rating system was developed to prioritize research and control efforts for preventing species invasions and eradicating established exotic pests. Four rating criteria were the species potential (1) to be introduced; (2) to establish: (3) to cause damage: and (4) to be controlled. Each species was rated independently for each criterion and these ratings summed to provide a total score. The system was developed with 24 exotic bird and mammal

species with well-known invasion and pest histories. It was then run on 14 of the California Department of Food and Agriculture most wanted exotic species list. The European ferret scored 25 out of a total 27 points....A quick response apparatus was also developed to provide information on perceived exotic species threats. It consisted of a data base of expert contacts and citations on exotic pest species damage, biology, ecology and control technology." (Smallwood and Salmon 1992)

Species with total scores of greater than 24 were recommended for inclusion on California Department of Food and Agriculture's most unwanted species list (Smallwood and Salmon 1992). However, Smallwood and Salmon (1992) did not provide the rationale for, or any data to support, the score given to the ferret. The Smallwood and Salmon (1992) study is widely discredited by pro-ferret organizations.

The basic challenge of a cost-benefit analysis is to convince CDFG that the benefits greatly outweigh the costs (or detriments) of ferret legalization. In a 1991 letter to Jeanne Carley (Californians for Ferret Legalization), Jerry Clark (Senior Biologist, CDFG Control and Eradication Division), stated a common CDFG opinion:

"The possible introduction of an exotic animal, even if that possibility is remote, is not worth the chance. We don't need any more examples like the English sparrow, starling, opossum, African clawed frog, or the carp; these are successfully competing with our native wildlife."

A brief and non-comprehensive inventory of adverse and beneficial economic impacts is presented next.

4.2.3.1. Potential Adverse Economic Impacts

In 2005 in their legislative analysis of Bill AB 647, a CDFG memo stated:

"Fiscal Impact [of ferret legalization].

Staff of wildlife areas, especially those located near residences, would ultimately need to include ferrets, along with dogs and cats, as potential urban predators, since an increase in ferret ownership would be anticipated following legalization. Similar impacts would likely occur in State Parks.

Economic Impact.

If the bill were to become law, there would likely be a large influx of domestic ferrets into California and the veterinary profession and pet supply businesses would gain increased business. A new financial burden on cities and counties would be expected from the large numbers of lost or abandoned ferrets, for which animal control agencies and shelters would be responsible. Also, many cities and counties would need to amend their animal ordinances to include ferrets. Retail pet stores can be expected to benefit from sales of ferrets which currently are only available outside California."

In 1995 in a letter to the CDFG Wildlife Protection Division, William Sandige (Program Supervisor, Pest Exclusion Branch, Department of Food and Agriculture) estimated costs involved in running the border station programs at over 8 million dollars; Sandige also tallied the following number of instances of attempted (illegal) animal importations in just year 1995: 219 instances of intercepted ferrets, 3 instances of alligator, 1 instance of 46 baboons, 2 instances of black bear, 1 of catfish, 1 of chimpanzee, 1 of crayfish, 1 of crow, 1 of flying squirrel, 36 of gerbil, 2 of hawks, 9 of hedgehog, 1 of live fish, 40 of Monk parakeet, 1 of orangutan, 1 of prairie dogs, 1 of raccoon, 4 of snapping turtle, 2 or squirrel, 3 of tortoise, and 1 of waterbuck.

Various federal agencies report on the high cost of managing invasive species—an excerpt is provided here:

"Introduced non-native species may cause widespread destruction by rapidly taking over an area and eliminating economically profitable native species. This can result in enormous spending by state and federal agencies as they attempt to eradicate pests and restore natural species. A study published by the US Congress, Office of Technology Assessment, Harmful Non-Indigenous Species in the United States, finds that the US alone spends hundreds of millions to perhaps billions of dollars trying to repair the damage of harmful exotic species. Numerous other economic sectors may be negatively affected, including agriculture, forestry, fisheries and water use, utilities, and natural areas. Exotic species may cause economic damage by (1) hybridizing with valuable species and producing worthless crossbreeds, (2) carrying or supporting harmful pests, and (3) possibly reducing

recreational prospects in an area. Another part of economic impact is one which has social and health consequences as well.

For example, Great Lakes water users spend tens of millions of dollars on zebra mussel control every year. Affected municipalities and industries, using large volumes of Great Lakes water, expend approximately $360,000 per year on zebra mussel control; small municipalities average $20,000. Nuclear power plants average an additional $825,000 of additional costs per year for zebra mussel control. As the zebra mussel spreads to inland lakes and rivers across North America, such as the Mississippi River Basin and Lake Champlain, so do the costs to water users.

Not only may exotic species import diseases that affect related species, but humans as well. Often cures are costly. The threat of non-indigenous species is their unpredictability. They may be poisonous, serve as vectors for human disease, or create conditions for disease to spread. Invading species may also breed with native species, resulting in dangerous or poisonous hybrids, which humans may unknowingly consume. Other invading species of fish (such as the sea lamprey, ruffe and round goby) can harm native fish. Reductions in native fish populations (such as lake trout, walleye, yellow perch and catfish) threaten a sport and commercial fishing industry that is valued at almost $4.5 billion annually and supports 81,000 jobs." (Exotic Aquatics on the Move, a Joint Project of National Sea Grant Network & Geographic Education Alliances; http://www.iisgcp.org/exoticsp/ans.htm)

4.2.3.2. Potential Beneficial Economic Impacts

One obvious beneficial economic impact of ferret legalization would be the creation of a licensing system and the generation of licensing program revenues. This would only be a beneficial economic impact if the license program revenues exceeded the cost of running the licensing program. Another potential economic benefit is the stimulus of the pet trade and pet supply industry. A pro-ferret organization opinion is reproduced here:

> "Ferret fanciers, the vast majority of whom are working or professional women between the ages of 35 and 54, annually spend an estimated $400 million on their pets in food, medical care, supplies and toys, and, increasingly, travel to and participation in championship ferret shows. (They spend an additional $16,000,000 in sales taxes)." (p. 33, Phillips and Shimbo 1990).

Note however that the State of California does not currently interfere with the sale of ferret-related pet products.

Pro-ferret organizations also argue that enforcing the ban on ferrets has an adverse economic impact. Excerpts are provided:

> "Enforcing this unnecessary ban wastes state resources." (Ferrets Anonymous 2010)

> "The DFG's intransigence certainly produces fiscal costs. The Department of Food and Agriculture must enforce the ban at its inspection stations. From 1980 to 1995, the number of interceptions has increased more than 260 percent, from 70 to 256. While the Department of Agriculture won't put a price on enforcing this policy, it no doubt exists....The DFG itself has squandered public resources holding meetings, producing supposed fact-sheets and writing letters in opposition to the legalization of ferrets. It also wastes money enforcing the law, sending as many as five law enforcement officers to a single 'ferret bust'." (p. 18, Lynch 1996)

Marshall Farms USA Inc. brought a lawsuit against the California Fish and Game Commission (filed December 9, 1996, San Diego County Superior Court) on the grounds that companies that breed ferrets are adversely economically affected, as they are precluded from selling pet ferrets in California; the suit was not successful.

The economic impacts, both beneficial and adverse, of ferret legalization may need to be analyzed further in the EIR.

4.2.4. Summary and Opinion

To legalize the importation and possession of ferrets in California by a policy change, CDFG concerns would need to be addressed and mitigated. CDFG is concerned with the cost of managing a regulatory program for ferrets; it is not clear if

license revenues would full cover these costs. More importantly, CDFG would need assurance or proof that fertile ferrets, hybrids, or even polecats will not establish feral breeding populations and impact wildlife, or the environment in general. The simplest solution is to allow only sterilized ferrets to be imported into California. However, it would be impossible to stop the importation of fertile ferrets or hybrids or polecats in to California, as evidenced by the current ease of importing a ferret into California during a full ban. Various strategies have been suggested to determine whether or not ferrets could establish feral breeding populations and impact wildlife: analysis of case studies involving unconfined ferrets or polecats, performance of a controlled experiment or pilot study, or performance of a risk analysis or cost-benefit analysis. Such a study or analysis would be costly and would take several years to complete; because of the possibility that hybrids or polecats could be imported into California, the study would need to analyze hybrids and polecats as well. Both pro-ferret organizations and anti-ferret organizations would need to agree upon the methods and conduct of the study. We are skeptical that such a study could either fully condemn or exonerate the performance of fertile ferrets, hybrids, and polecats in a wild California setting.

The economic impacts, both beneficial and adverse, of ferret legalization may need to be analyzed further in the EIR.

5. DATA COMPILATION METHODS AND RESULTS

5.1. LITERATURE REVIEW

5.1.5. Journal and Textbook Review

The literature search was limited to the English language, and focused on the North American region. The literature regarding the use of the ferret as a laboratory subject, and in biomedical research, was ignored; the exception was any subjects pertaining to human safety, such as rabies or physical attack. See bibliographies such as that by Clingerman *et al.* (1991) to pursue this literature.

The following previously published bibliographies on ferrets and polecats were examined intensively:

- Shump, A.U., K.A. Shump Jr., G.A. Heidt, and R.J. Aulerich. 1976. A bibliography of Mustelids: Part I—Ferrets and Polecats. Michigan Agricultural Experimental Station, East Lansing, Michigan. 53 pp.
- Blandford, P.R.S. 1987. Biology of the polecat *Mustela putorius*: a literature review. Mammal Review 17(4):155-198.
- Whisson, D., and T. Moore. 1997. An annotated bibliography on the ferret (*Mustela putorius furo*). California Department of Fish and Game, Wildlife Management Division, Bird and Mammal Conservation Program Rep. 97-3, Sacramento, CA. 37 pp.

At least 250 journal articles and textbooks were reviewed.

5.1.6. Newspaper Article Review

At the Sacramento State Library, the ProQuest (Newspaper) Database (ProQuest LLC, Cambridge Information Group) was accessed through a CSUS subscription; this database allows the search of newspapers from 1977 to the present, and is the largest digital newspaper archive. Queries began with different combinations of key words and strings such as: ferret, ferret*, pet, pet*, bite, bite*, wildlife, livestock, poultry, harass, rabies, legalization, etc.

5.2. INTERVIEWS AND OTHER SOURCES

Phone conversations / interviews were cited as personal communications; transcripts were recorded where possible and can be provided upon request. Mr. Dale Steele (CDFG Wildlife Nongame & RAP Programs) was interviewed on August 17, 2010. Mr. Steele also made available CDFG's entire file collections on ferrets (primarily from Ron Jurek's work), which consisted of over 8 feet of stacked documents. CDFG file reviews were performed on August 17 and 19, 2010.

Internet search engines were used to access Internet resources. State agency websites were searched for information and policies regarding ferrets. New Zealand websites were also consulted including:

- http://www.agresearch.co.nz/

- http://www.landcareresearch.co.nz/research/wildlifeecol/ferrets/

Pro-ferret organizations' websites were also reviewed, including:

- Ferret Central: Home of the Ferret Frequently Asked Questions http://www.ferretcentral.org/
- Ferrets Anonymous, http://www.ferretsanonymous.com/
- American Ferret Association, http://www.ferret.org/index.htm
- Ferrets Magazine, http://www.smallanimalchannel.com/ferrets-magazine/ferret-exclusive-topiclist.aspx
- Modern Ferret Magazine, http://www.modernferret.com/index.html

5.3. STATE AGENCY QUESTIONNAIRE

5.3.7. Questionnaire Methods

Several surveys of state agencies have been performed by others:

- California Domestic Ferret Alliance (1988)
- In early 1990s, the New Hampshire Fish and Game Public Affairs Division apparently distributed a questionnaire on ferrets (retyped in Californians for Ferret Legalization 2000); this has not been verified.
- Jurek and Ryan (1999)

Jurek and Ryan (1999) surveyed all of the wildlife agencies in the USA; the results of this survey are discussed later in this report. In our review of the agency responses to Jurek and Ryan (1999)'s questionnaire, it became apparent that many wildlife agencies did not want to, or could not, respond to the questionnaire because another agency in their State (agriculture or health agency) regulated ferrets and thus, kept the pertinent records. Therefore, an attempt was made to get a response from each State's health agency and agriculture agency, besides their wildlife agency. The data solicitation for our study was expanded to the Canadian Provinces as well, although this was outside the scope of the study contract. The solicitation would ideally have been provided in the French language as well, but was not.

One of the goals of this study was to replicate and update the Jurek and Ryan (1999) questionnaire. For the most part, our questionnaire faithfully reproduced the questions in Jurek and Ryan (1999). Some questions were added or modified to address the current perceived concerns expressed by the Commission or CDFG. Another modification was the addition of questions that allowed the agency respondent to estimate a value using their professional opinion, such as number of ferret attacks on humans per year, when such data were not available. The questionnaire was created and printed as a hardcopy document. It was also produced as a Microsoft Word 2003 document using password protected form fields and an Adobe Acrobat 9 Portable Document Format (PDF) password-protected form, both of which allowed respondents to type in their responses via computer, but not alter the questions. See Appendix A for a copy of the blank questionnaire.

The questionnaire was distributed by regular mail and electronically by email; pre-paid Federal Express air bills addressed to the CSUS Department of Biological Sciences were provided in the mailed questionnaires to facilitate questionnaire submittal. Logs were kept of all correspondence with governmental officials (provided in Appendix B). Email correspondence was saved in its native format (Microsoft Outlook file format ".msg") and printed to PDF. CSUS Department of Biology students Navneet Shah and Angela DePalma-Dow assisted Dr. Graening in the dissemination of the questionnaires, correspondence with agency personnel, and tabulation and database entry of the questionnaire responses.

5.3.8. Questionnaire Results

Completed questionnaires received as email attachments were saved in their native formats and also printed to PDF. Completed questionnaires received by US post or by Federal Express were digitally scanned to PDF. Appendix C provides these questionnaire responses. Some States sent separate responses from each participating agency; other States combined their answers into one response. Many respondents sent in questionnaires with many questions left blank, and answers only to questions in their area of expertise. Unclear answers were followed up by telephone call. For those agencies who did not submit a completed questionnaire, reminder emails and phone messages were provided to encourage even a late submission. When no written response was ever received, an attempt was made to interview the appropriate

agency personnel by phone and complete answers to the questionnaire by this method. These phone interviews are documented as separate data sources in Appendix C.

Each of the 50 States and 3 of the 12 Canadian Provinces provided at least a partial response to the questionnaire (see following table). Of the possible 150 agencies in the USA (a wildlife, agriculture, and health agency in each State), 39 wildlife agencies, 20 agricultural agencies, and 17 health agencies provided at least a partial response. The global economic recession has apparently hindered response to our questionnaires, as several agency personnel stated that they did not have sufficient manpower or funds to participate in the study, and often blamed the national economic recession.

The responses to the questionnaire were entered into a relational database (Access 2007, Microsoft, Inc.). Results of the questionnaire are discussed later in this report. For brevity, standard postal abbreviations for the United States of America (USA)'s States and Canada's Provinces were used:

Canadian Provinces—Alberta = AB, British Columbia = BC, Manitoba = MB, New Brunswick = NB, Newfoundland and Labrador = NL, Nova Scotia = NS, Northwest Territories = NT, Ontario = OT, Prince Edward Island = PE, Quebec = QC, Saskatchewan = SK, Yukon = YT; and United States—Alabama = AL, Alaska = AK, Arizona = AZ, Arkansas = AR, California = CA, Colorado = CO, Connecticut = CT, Delaware = DE, Florida = FL, Georgia = GA, Hawai'i = HI, Idaho = ID, Illinois = IL, Indiana = IN, Iowa = IA, Kansas = KS, Kentucky = KY, Louisiana = LA, Maine = ME, Maryland = MD, Massachusetts = MA, Michigan = MI, Minnesota = MN, Mississippi = MS, Missouri = MO, Montana = MT, Nebraska = NE, Nevada = NV, New Hampshire = NH, New Jersey = NJ, New Mexico = NM, New York = NY, North Carolina = NC, North Dakota = ND, Ohio = OH, Oklahoma = OK, Oregon = OR, Pennsylvania = PA, Rhode Island = RI, South Carolina = SC, South Dakota = SD, Tennessee = TN, Texas = TX, Utah = UT, Vermont = VT, Virginia = VI, Washington = WA, Washington District of Columbia = DC, West Virginia = WV, Wisconsin = WI, and Wyoming = WY.

Summary of Agency Response to the CSUS Questionnaire

	Wildlife	Agriculture	Health
USA			
Alabama	X		X
Alaska	X		
Arizona	X		
Arkansas	X	X	X
California		X	
Colorado		X	
Connecticut			X
Delaware	X	X	
Florida		X	
Georgia	X	X	
Hawai'i		X	
Idaho	X		X
Illinois	X	X	
Indiana	X		
Iowa	X	X	
Kansas	X	X	
Kentucky	X		X
Louisiana	X		X
Maine	X	X	X
Maryland	X	X	X
Massachusetts	X		
Michigan		X	

	Wildlife	Agriculture	Health
Minnesota	X	X	X
Mississippi	X		
Missouri	X		
Montana	X		
Nebraska	X		
Nevada	X		
New Hampshire	X		
New Jersey	X	X	X
New Mexico	X		
New York	X		
North Carolina	X		
North Dakota			X
Ohio			X
Oklahoma	X	X	
Oregon			X
Pennsylvania	X		
Rhode Island	X		
South Carolina	X		
South Dakota	X	X	
Tennessee	X		
Texas	X		
Utah		X	
Vermont	X		
Virginia			X
Washington	X	X	X
Washington, District of Columbia			X
West Virginia	X		
Wisconsin	X	X	
Wyoming	X		X
Count	39	20	17

Canadian Provinces			
Alberta			
British Columbia	X		X
Manitoba			
New Brunswick	X		
Newfoundland and Labrador			
Nova Scotia	X		
Northwest Territories			
Ontario			
Prince Edward Island			
Quebec			
Saskatchewan			
Yukon			
Count	3	0	1

5.4. LIMITATIONS / DATA DEFICIENCIES

Constantine and Kizer (1988) reported the following difficulties in getting complete and accurate data regarding ferrets:

> "Beginning in early 1986, we requested reports of ferret bites and attacks from all California counties and from two adjacent states. Requests for data from more distant states were also made concerning attacks on infants and rabies in ferrets. The medical literature was reviewed, as was literature regarding the habits of ferrets and their polecat progenitors and the existence of feral ferret populations. Early in the investigation it became apparent that some animal control personnel and laboratory workers needed help differentiating ferrets and weasels, whereupon a table summarizing differences was devised and provided to these persons. Other difficulties were experienced gathering and interpreting data. Ferret proponents made widely varying claims about the number of illegal pet ferrets existing in California (ranging from 100,000 to 500,000), and we lacked reliable figures on actual statewide numbers of either captive, stray, or feral ferrets. Owners of illegal ferrets generally were reluctant to report ferret attacks out of fear of prosecution or loss of their animals, and some bitten friends of owners were similarly reluctant. Most biting ferrets appeared to be strays or animals that had escaped or been released after biting their owners. Available reports, which were usually retrospective, generally lacked uniformity, and reflected varying degrees of effort in documenting details of the incident. Spectacular incidents, including those from rabid ferrets or involving infant maulings, seemed more likely to be reported." (pp. 3-4, Constantine and Kizer 1988).

Our study faced similar challenges in acquiring and interpreting data. There were many confusing articles in the literature that did not, or could not, differentiate ferrets from polecats. We made note of such instances, and chose to cite entire paragraphs rather than interpret the meanings contained within these articles. While administering the agency questionnaire, we found that many of our respondents stated that their agency did not track data on ferrets at all. Thus, we found that there is a general data deficiency on negative interactions between ferrets and the environment (wildlife, agribusiness, or human health).

6. TAXONOMY, ORIGIN, AND DISTRIBUTION

6.1. TAXONOMY AND NOMENCLATURE

6.1.1. Scientific Nomenclature

The taxonomic treatment of domesticated ferrets has varied greatly over the last three centuries, but most authors prefer the trinomen *Mustela putorius furo*, which is often incorrectly attributed to Linnaeus (1758). Linnaeus (1758) recognized the ferret as its own species *Mustela furo*, a taxon distinct enough, he determined, to separate it from its wild ancestor—the polecat, *Mustela putorius*. Other wild subspecies of *M. putorius* recognized by the USDA (see ITIS 2010) are *anglia* (Pocock 1936), *aureola* (Barrett-Hamilton 1904), *caledoniae* (Tetley 1939), *mosquensis* Heptner 1966, and *rothschildi* Pocock 1932. However, these subspecies are rarely mentioned in the literature. The steppe polecat—*Mustela eversmanii* Lesson 1827—is recognized by most authors as a distinct species, but some treat it as a subspecies of *M. putorius* (e.g. Bachrach 1930). Ferrets and polecats are grouped with martens, weasels, mink, etc. into the subfamily Mustelinae Fischer 1817 and the family Mustelidae Fischer 1817 (Anderson 1989; ITIS 2010).

Dragoon and Honeycutt (1997) concluded that the family Mustelidae was paraphyletic, and proposed to separate skunks and stink badger and erect the family Mephitidae for the genera *Spilogale*, *Mephitis*, etc. Dragoon and Honeycutt (1997) also state:

> "The inability to determine monophyletic groups within the Mustelidae has contributed to confusion regarding sister-group relations within the family...The mustelids have been a difficult group to classify, and the Mustelidae is in need of systematic revision." (pp. 427-428, Dragoon and Honeycutt 1997)

The validity of the taxa *Mustela putorius* and *M. p. furo* has been challenged, and often recombined or misspelled, and synonyms include the following: *Mustela furio* [sic], *Mustela putorious* [sic]; *Putorius vulgaris*; *Putorius foetidus*, *Putorius furo* (Griffith 1827; Gray 1843; Bachrach 1930; Cabrera 1930; Corbet and Southern 1977; Blandford 1987). Similarly, the vernacular names of *Mustela putorius sensu lato* and its subspecies are quite varied and include: European

polecat, polecat, western polecat, ffwlbart, fitch, fitchet, fitchew, fitcht, foulmart, foulmarten, foumart, fitch, iltis (Bachrach 1930; Corbet and Southern 1977); see Thomson (1951) for additional vernacular terminology and etymology. The vernacular names for *M. p. furo* are typically modified from those of the polecat, previously mentioned, such as domestic ferret, domesticated fitch, and European ferret, but the ferret is often synonymized with "polecat" which confuses the differences between genomes of those populations artificially or naturally selected (Bachrach 1930; Anderson 1989). Such synonymy has also made difficult the determination of the adverse impacts that ferrets alone may have caused upon the environment. Some consider the domesticated ferret to be sufficiently divergent from the European polecat and steppe polecat to deserve specific treatment, and many authors use the taxon *Mustela furo* (e.g. Linnaeus 1758; Bachrach 1930; Corbet and Southern 1977; Blandford 1987; Poole 1973). On the other hand, authors such as King (1990) believe elevation of the ferret to the specific level implies greater phylogenetic separation than truly exists between ferrets and polecats. King (1990) also reports that the traditional taxonomic characters (pelage color, cranium measurements) are unreliable in differentiating polecats from ferrets.

The latest genetic analysis of *Mustela* by Davison *et al.* (1999) leaves little hope that the phylogeny of the ferret will be resolved:

> "A holarctic species complex? Is it possible to resolve the major relationships within the polecat group (Youngman, 1982)? Perhaps unexpectedly, interspecific variation was generally too low to properly resolve species level relationships. In general, even bootstrap support for the major branches on the *Mustela* tree was poor (Fig. 3a). Variation was greatest between *M. nigripes* and {*M. putorius*, *M. furo*, *M. eversmannii*}, at just over 1% of positions in the cytochrome b gene (Fig. 3a). The mitochondrial results suggest that either polecats and European mink have recently speciated, or else gene flow through hybridization has prevented haplotype divergence, resulting in an unresolved molecular phylogeny. Therefore, the molecular genetics does not resolve whether ferrets were originally domesticated from *M. putorius* or *M. eversmannii*. In Britain, some local populations of polecats may now be most closely related to feral ferrets through hybridization. Furthermore, the degree of nuclear introgression of domestic ferrets and polecats may be so extensive as to rule out ever tracing their wild ancestor." (p. 160, Davison *et al.* 1999).

Some authors, such as Forsyth *et al.* (2003), describe the combined polecat-ferret taxon (*Mustela putorius sensu lato*) as a spectrum, with the polecat at one end displaying the genotype and phenotype of an un-tame animal able to thrive in the wild and colonize suitable habitat, and the ferret at the other end, displaying the genotype and phenotype of a domesticated animal that cannot thrive in the wild. Domesticity traits may be more attributable to the effects of rearing in captivity and handling by man, rather than whether the animal is genetically closer to a ferret than a polecat (Poole 1962).

Concomitant with the difficulties in differentiating ferrets and polecats genetically are the difficulties in differentiating ferrets and polecats phenotypically. King (1990) reports that the traditional taxonomic characters (pelage color, cranium measurements) are unreliable in differentiating polecats from ferrets. Another author confirms this problem:

> "The darkest forms of the Ferret may be indistinguishable externally from the Polecat, but generally the pelage is either albino or like that of the Polecat but lighter, as if the pigment had been partially washed out, and with more extensive white on the face and throat (Walton, 1977). The situation is further complicated by man's habit of producing 'fitch ferrets' or 'polecat-ferrets' by crossing true Ferrets with wild Polecats (Lever, 1977; Frazer, 1980). In most parts of Britain the dark form of the domesticated Ferret is even called by the name 'polecat', whereas in Wales the name is used for either the wild or domestic animal (Walton, 1970)." (p. 162-163, Blandford 1987)

Ashton and Thomson (1954) attempted to differentiate the different subspecies of *M. putorius* based upon cranial measurements. Other authors have used skull morphology:

> "The Scottish Polecat was described by Tetley (1939) from Lochinver, Sutherland (Highland), as having a marked postorbital constriction in the skull, distinguishing it from the straight postorbital region in the English/Welsh form. He also commented on the large size of the skulls, and that the skins did not differ from the those of the English/Welsh form. The diagnostic cranial feature of this form is also the only constant diagnostic feature of the Ferret, *Mustela putorius furo* Linnaeus, 1758, as described by Ashton (1955)." (p. 163, Brandford 1987).

Branford (1987) provides the anatomical data necessary to separate *M. p. putorius* and *M. p. furo*, but states "Absolute separation from Ferrets and Pole-cat Ferrets is difficult for single skulls but can be done with about 95% accuracy." (p. 163, Brandford 1987).

To complicate matters, He *et al.* (2002) reports that there is significant sexual dimorphism in the ferret skull.

King (1990) summarizes the resulting management problem:

"Since the domesticated ferret *Mustela furo* L. is interfertile with the polecat and as some dark forms of polecat/ferret hybrids are externally indistinguishable from polecats, confusion has occurred in the monitoring of the status and history of the indigenous polecat, particularly since the late nineteenth century." (p. 11, Howes 1980)

6.1.2. State Agency Nomenclature

The Jurek and Ryan (1999) questionnaire summarized state agency nomenclature as follows:

"Nomenclature. Various names are used in state regulations to identify ferrets. Thirty-one (62%) of the states use 'ferret', or 'domestic ferret', or 'European ferret', or a combination of these. Less common terms used by some states are fitch, fitch ferret or European fitch ferret, European polecat, polecat, and Mustela putorius furo. No states reported using the terms English ferret or polecat/ferret hybrid." (p. 9, Jurek and Ryan 1999)

In the CSUS Questionnaire we asked a similar question:

"Which of these terms are used in your State to refer to the domesticated ferret (*Mustela putorius furo*)?"

At least 44 States and several Provinces use the term 'ferret' or 'domestic ferret' or 'European ferret': AK, AL, AR(2)*, BC(2), CA, CO, CT(2), DC, DE(2), GA, HI, IA(2), ID, IL, IN, KS, KY(2), LA, MA, MD, ME, MI, MN, MO, MT, NB, ND, NE, NH, NJ, NM, NS, NV, NY(2), OH, OK(2), OR, PA, RI, SC, SD(2), TN, VI, VT, WA(3), WI(2), WV, WY(2).

Wyoming and Iowa also use the term 'polecat'. New York, Wisconsin, and Wyoming also use the term 'fitch' or 'fitch-ferret'. Some States and Provinces also use the trinomen *Mustela putorius furo*: AK, CA, GA, HI, MA, NB, OH, VI, and VT. Michigan uses the binomen *Mustela furo*, and Nevada uses the binomen *Mustela putorius*.

**Note: when more than one agency in the same State responded similarly to a question, we noted the tally in parentheses. For example, "AR(2)" indicates that two different Arkansan agency personnel responded, and both indicated that the term "ferret" was used in their State.*

(data compiled from CSUS questionnaire responses; Appendix C).

6.1.3. Summary and Opinion

The taxonomy of the genus *Mustela*, and even the family Mustelidae, is not well defined taxonomically. The genus *Mustela* is considered a holarctic species complex that may not be able to be resolved because of hybridization. Reproductive isolation apparently is not a distinguishing character, as the polecat, steppe-polecat, ferret, and black-footed ferret can interbreed. The taxon *Mustela putorius sensu lato* is considered a spectrum, with the polecat at one end displaying the genotype and phenotype of an un-tame animal able to thrive in the wild and colonize suitable habitat, and the ferret at the other end, displaying the genotype and phenotype of a domesticated animal that cannot thrive in the wild. Cranial measurements (post-mortem) are the only reliable way to differentiate polecats from ferrets that are caught in the wild. The unresolved taxonomy and difficulties in identification may pose a challenge to the regulation of ferret importation.

6.2. ORIGIN AND DISTRIBUTION

6.2.1. Origins of the Ferret

The subfamily Mustelinae probably originated in Eurasia (Anderson 1989). The native range of the subgenus *Putorius* is Eurasia, except for the black-footed ferret (*M. nigripes*), which is limited to the Great Plains ecoregion of North America (Anderson 1989). Some authors, including Linnaeus (1758), report the polecat's native range as Africa, or specifically Egypt, or in the case of Cabrera (1930), Morocco; other authors, such as Lewington (2007) refute this claim. Wild *Putorius* typically inhabit steppes, prairies, meadows, and open forest (Anderson 1989). Branford (1987) provides a detailed description of the distribution and preferred habitats of *M. putorius sensu lato.*

The domesticated ferret is often cited as having been selectively bred in captivity for over 2 millennia, but its origin is not clear (Thomson 1951; Fox 1988; Anderson 1989). Corbet and Southern (1977) explain:

> "Ferret. *Mustela furo* Linnaeus 1758. Taxonomic status: A domesticated form of rather complex status. It has been bred since Roman times at least (mentioned by Strabo in the first century B.C.). It is derived either from the polecat, *M. putorius*, with which it is fully interfertile, or from the steppe polecat, *M. eversmanni*, which it resembles most closely in the form of the skull. These two wild forms have been considered conspecific, but current opinion in eastern Europe and Russia, where their ranges appear to overlap, is that they are good species. In view of this uncertainty it is best to treat the domesticated ferret provisionally as if it were a distinct species. The situation is further complicated by the habit of producing 'fitch ferrets' or 'polecat ferrets' by crossing true ferrets with wild polecats." (Corbet and Southern 1977, p. 352)

The earliest references to a domesticated ferret may be by Aristotle in the fourth century B.C.E. or possibly in Palestine circa 1,000 B.C.E. (Thomson 1951; Zeuner 1963; Blanford 1987). Authors such as Boyce *et al.* (2001) suggests a different, earlier origin in Africa:

> "The domestic ferret is believed by many to have been first domesticated about 3000 years ago by the ancient Egyptians." (p. 693, Boyce *et al.* 2001).

These authors do not convincingly prove that these early references refer specifically to ferrets, and not to polecats, weasels, or other mustelids common to the region in question; furthermore, interpretations were made in the translations from the original languages (see review by Owens 1969). There is also little evidence to suggest that the purpose of selective breeding was to produce a pet, rather than a hunting companion, as many early references indicate their use to hunt rabbits.

There are references to ferrets in Britain as early as the thirteenth century C.E. (Lever 1985). Most published sources agree that the ferret was derived from *M. putorius sensu lato* or *M. eversmanii* or their hybrids (Miller 1933; Blandford 1987; Owens 1969). The ferret is apparently interfertile with *M. p. putorius* and *M. eversmanii* (e.g. Corbet and Southern 1977). Fox (1988, p. 6) reports that, "the female ferret and male stoat (*Mustela erminae*) will also produce fertile hybrids." The black-footed ferret (*M. nigripes*) is apparently interfertile with *M. eversmanii*, and may be descended from it (Chadwick 1991). Davison *et al.* (1999) suggest that the genetic differences between *M. nigripes* and *M. eversmanii* may be intraspecific. Davison *et al.* (1999) have recently attempted to study the ferret genome, and report the following:

> "Domesticated polecats or ferrets (*Mustela furo*) have been recorded in association with humans since the fourth century BC when Aristotle described them in a treatise on animals and physiognomy (Thomson, 1951). The Old Testament also ordained that they are one of the unclean animals (Lev. XI. 29 and 30; Thomson, 1951) and Strabo (63 BC-24 AD) reported that 'Libyan' ferrets were used to rid the Balearic Islands of a plague of rabbits (Thomson, 1951; Blandford, 1987). However, except for recent speculation regarding their origin (Zeuner, 1963; Blandford, 1987 and references therein), and some biological studies on their morphology and karyotype (Frykman, 1972; Grafodatskii et al., 1982; Wang et al., 1984), almost no progress has been made in uncovering the centre of their domestication. Even the parent species of domestic ferrets are uncertain. They may have been domesticated from the European polecat (*M. putorius*), or from its eastern congener, the steppe polecat (*M. eversmannii*), which has a superficially more similar cranial morphology (Blandford, 1987). Since *M. putorius* and *M. eversmannii* are occasionally reported to hybridize where they overlap in their distribution, the reality of a true species split has been debated (Blandford, 1987), and several authors have at least considered whether *M.*

putorius, *M. eversmannii*, and the endangered *M. nigripes* from North America (black-footed ferret) could be viewed as one Holarctic species (Anderson, 1977; Anderson et al., 1986; O'Brien et al., 1989). Black-footed ferrets and polecats produce fertile hybrids in captivity..." (pp. 155-156, Davison *et al.* 1999).

Ferrets are often cited as derived from an albinistic polecat, such as these excerpts:

"The ferret of England and America, variously called *Putorius vulgaris*, *P. foetidus vulgaris*, or *Mustela putorius*, is believed by some authors to be a domesticated variety or albino mutant of the wild polecat, *Putorius foetidus*, or northern and central Europe...the tame ferret and its wild relative interbreed freely, and the hybrids are believed to give the color varieties appearing even in the same litter with white kits." (p. 234, Bissonnette 1950).

"Ferrets are the albino domesticated form of the polecat." (p. 136, Hvass 1961)

"The ferret, *Mustela putorius furo* L., is an albinotic, domesticated form of the polecat." (p.244, Kowalski 1976)

"The polecat-ferret is, as its name implies, a cross between the wild (European) polecat and domestic ferret. There has been—and indeed still is—much controversy among systematists over the origin of the domestic ferret; all agree that it is a domesticated albino descendant of the polecat, but whether its ancestor is *M. putorius* (with which it is fully infertile) or the (Asiatic) steppe polecat (*M. eversmanni*) remains uncertain. These two wild forms have been regarded in the past as conspecific, but current opinion in eastern Europe and Russia, where they appear to be sympatric, is that they are separate species." (Lever 1985, p. 60)

"The ferret . . . is the product of selective breeding of albino polecats, white animals being chosen due to their visibility in the twilight when used to catch or flush rabbits." (p. 11, Howes 1980)

The majority of the literature reviewed does not support the contention of Lever (1985) and others that the domesticated ferret derived from an albinistic polecat. Example text is provided:

"The ferret has long been thought to be an albino variety of the European fitch. This is probably not true. In the first place the ferret is not an albino." (p. 308, Hagedoorn 1954)

"The original ferret was undoubtedly the color of a wild polecat and we do not know at what period the break to white occurred." (p. 491, Owen 1969)

The latest genetic analysis of *Mustela* (Davison *et al.* 1999) demonstrates that the ferret's origins are obscure and complex. But albinism is apparently common in ferrets:

"A litter of 7 wild caught polecats was also used in the experiment...Subsequently on mating a pair of the some of the offspring proved to be albinos. This indicated that they were hybrids rather than pure bred European polecats, for the albino gene is rare in the wild polecat populations whilst it is common amongst domesticated ferrets." (p. 27, Poole 1972).

The modern pet ferret genome displays a range of colorations and markings, and the American Ferret Association Standards include at least 7 colors and 6 patterns (Schilling 2007).

One of the primary uses of ferrets was as a hunting companion, where the ferret would flush out, or "ferret out", prey from holes or other refugia (Everitt 1897; The New Hunter's Encyclopedia 1966; Woodford 1967). White-phase and/or albino ferrets may have been more desirable because they were not mistaken for prey during hunting and were easier to spot in brush. White ferrets were often used in falconry so that the trained hunting hawks do not mistake the ferret for wild prey that have non-white coats (Woodford 1967). The account of ferreting by Glasier (1982) is another example:

"When rabbits are not lying about, you can go ferreting with your hawk. If you have white ferrets, and not the polecat variety, and get the hawk used to them in advance by having their hutch and run in her view, she will not try to catch them when out hunting." (Glasier 1982, p. 171)

Mannix (1967) similarly explains the use of the white-phase, or albinistic, ferret:

"There are two types of ferrets: the brown with black markings, called a 'fitch,' and the albino variety, called the 'English ferret.' The English ferret was developed so that ratting terriers could more readily distinguish the ferrets from the rats. The two types interbreed freely, and the young are either pure white or fitch, never piebald." (p. 93, Mannix 1967)

There are various authors that maintain that ferrets have only recently been domesticated; some excerpts are provided:

"Ferrets are claimed to have been domesticated for over two thousand years[Footnote 1], and have been used as aids in hunting, especially rabbits.

[Footnote 1] = Wildlife Biologist Ronald Jurek, of the California Department of Fish and Game, disputes this assertion, and believes that the ferret has been domesticated for a far shorter period. (Personal communication, April 25, 1997)." (pp. 1, 8, Umbach 1997)

"The ferret has long been considered to be a domesticated fitch (polecat). It is true that the skull of the present ferret closely resembles that of the fitch, but this resemblance may have been due to cross-breeding with the fitch after the ferret was established as a domestic breed From experience with the cage-bred fitch it seems to me almost impossible to believe that anybody would ever have thought of domesticating this animal. Even quite tame fitches are so quick and bold and snappy that the idea of going ferreting with a fitch sounds like going hunting with a pet tiger. It is probable that the original ferret was a domesticated Siberian fitch, a species that can readily be tamed and has a much quieter and more amiable disposition than our local black fitch." (p. 54, Hagedoorn 1954)

"We cannot say that domestic animals are different from wild animals in that they are tame, for there exists domestic animals that are not any tamer than their wild-living relatives. There is only one definition that fits all domesticated animals, and it is the same that fits all cultivated plants. The races of cultivated organisms are fitted to live in symbiosis with mankind. They differ from related wild species and from the wild species from which they are descended, in their inherited make-up, in some way which makes them useful to man, and sometimes also dependent upon man." (p. 57, Hagedoorn 1954).

The crux of the argument is that the domesticated form (*M. p. furo*) has been repeatedly crossed with the wild form (*M. p. putorius*) in selective breeding programs, especially in the United Kingdom. Here are some examples from the literature:

"Although ferrets have been selectively bred over the centuries, one should not presume that man's development of ferrets from polecats means that the ferret has undergone isolation from and differentiation from polecats for thousands of years. On the contrary, ferret breeders have periodically crossed ferrets with polecats to produce the polecat-ferret or fitch-ferret coat color pattern (Fennell, 1841; Matthews, 1968; Corbet and Southern, 1977)." (p. 16, Constantine and Kizer)

"By hybridizing ferret and European fitch, beautiful first-generation hybrids are produced, having food requirements somewhat less strict than in the wild species, and very valuable pelts. These hybrids were less susceptible to distemper than fitches, but seemed more susceptible than ferrets." (p. 309, Hagedoorn 1954)

"With a few animals there is the possibility of utilizing a domestic animal to ameliorate a wild fur-bearer. The fitch will readily cross with the domestic ferret, and the hybrids are fully fertile. From such hybrids I have produced a few animals that were as tame as ferrets, and that did not need a more elaborate diet than ferrets, but that had as beautiful a pelt as the wild dark fitch." (p. 310, Hagedoorn 1954)

"That the Ferret, in its natural condition, possesses habits nearly similar to the Polecat, is clearly indicated by its great resemblance in point of structure and form. But in this climate it exists only in a state of domestication; indeed its true natural colour and appearance are so little known, that, up to the present day, it is considered by many as being merely a variety of the Polecat. In support of this opinion, it is urged that they will readily breed together; and it has often been stated that the breeders of Ferrets will improve the race by the admixture of the other animal." (p. 162, Bell 1837)

> "The subject of ferret hybrids is a hotly debated topic in many ferret circles. Very simply put, a hybrid is a cross between a domestic animal and its wild counterpart—in this case, a ferret and a polecat...You must examine what it is that makes people attracted to the ferret hybrid in the first place....Some argue that if done responsibly and correctly, hybrid breeding can enhance existing ferret bloodlines and make ferrets healthier, hardier, and sounder by introducing polecat blood into the mix." (p. 27, Schilling 2007)

Lewington (1988) gives a comparison of ages of domestication of the following pets: dog—10,000 years; cat—5,000 years, and ferret—2,000 years.

There is also a minority view in the literature that ferrets are not truly domesticated at all, or should not be considered domesticated, because of their unprovoked attacks upon humans and other non-domesticated, or non-companion, behavior such as cannibalism of their own kits. Bell (1837), for example, suggests that simply the smell of blood will cause a (domesticated) ferret to revert to a "savage" state similar to a polecat. Harding (1915) gives contradictory statements on the tameness of ferrets:

> "They [ferrets] are capable of only partial domestication, acquiring a kind of familiarity with man and submitting with perfect quietness to his handling, but apparently never forming any very decided attachment, and they never cease to be dangerous if not carefully watched, especially where infants are within their reach." (p. 18, Harding 1915).

> "Ferrets that are handled a great deal generally become quite tame. The animal is possessed of more intelligence than usually known. Those kept and handled for months are apt to become so tame that they will not leave even when given freedom but are on hand at feeding time. In several instances ferrets and cats have been known to eat from the same dish. Others become so attached to their owner, that they are at his heels much of the time, when he is around the premises...All know how a dog becomes attached to his master. It seems ferrets have same fondness, at least to some extent." (pp. 22-24, Harding 1915)

Some authors, including Bell (1837), claim that this interplay of wildness and tameness make the ferret an excellent hunting companion:

> "This combination of docility and ferocity has, however, rendered the Ferret subservient to the use of man, by enabling him to employ the animal with great advantage in the capture of Rabbits, and in the destruction of Rats and other vermin." (p. 164, Bell 1837).

Hitchcock (1994) also considers the ferret to be non-domesticated:

> "The European ferret, conspecific with the European polecat, *Mustela putorius*, is not a domesticated animal even though it has been captive bred by man since at least Roman times. It has been selectively bred to be an intelligent, efficient, effective and vicious killer, trained to 'ferret out' and quickly dispatch rodents and rabbits and to respond to the commands of the 'handler' (an adult human). Some were also captive bred for fur, and both the animal and the fur were called 'fitch.' Intraspecific crosses have occurred between both of the selectively bred strains and have backcrossed as well with parent stock under both captive and 'wild' conditions throughout this period. Apparent docility toward the 'handler' was also selected for in those utilized in 'ferreting.' European ferrets are quite playful, 'cute' and like to be held, but until recently were certainly not considered desirable pets." (p. 207, Hitchcock 1994)

Schilling (2007) argues that ferrets fit the criteria requisite for domestication:

> "Yes, Ferrets are Domesticated. Domestication is a long process in which people selectively breed wild animals in captivity for human benefit. There are three main criteria for domestication: Humans select the animal to be bred...The animal experiences some type of genetic change that reflects the human selection and distinguishes it from its wild counterparts...Humans derive some benefit from the domestication of the animal." (pp. 22-23, Schilling 2007)

Kowalski (1976) wrote an entire book on the domestication of mammals; some pertinent excerpts are provided:

> "From a zoological standpoint domestication is a specific phenomenon close to symbiosis: it enables the two parties, i.e. the domestic species and man, to conquer new environments and enlarge the population. There is no strict borderline between domestic and wild animals. It is well-known that many domesticated animals easily run wild and in suitable habitats are able to exist and reproduce without man's care...At the same time many species of fur-bearing mammals, usually not included in the group of domestic animals, have been raised for many generations and their new breeds have been obtained. Domesticated mammal species are generally social in natural conditions. Perhaps their ability to submit the leader of a herd has facilitated their submission to man." (p.238, Kowalski 1976)

> "The domestication of mammals has been the greatest and longest experiment carried out by man on animals. It should be stressed, however, that in spite of the great morphological variability of domestic species, man has not succeeded in obtaining even a single new species of mammals. This great variability of animals which observed in breeding is of infraspecific character. Each species of domestic animal derives from one wild species, and the changes to which it was submitted have not reached the level of specific differentiation. Domestic forms zoologically belong to the same species as their wild ancestors although often for the sake of convenience a separate Latin species name is given to them." (pp. 239-240, Kowalski 1976)

Poole (1962) reports on behavioral differences between polecats and ferrets and the effects of rearing in captivity.

6.2.2. Introduction into North America

Ferrets are often reported as being first imported into the USA from Europe in the late 19th century for use in hunting and pest control. Harding (1915) states that ferrets were first brought to USA from Spain circa 1875. European ferrets were originally imported into the US around 1875 and used primarily for ratting, according to Dolensek and Burn (1976). Fox (1988) reports their use in fur production in the early 1900's. Mannix (1967) gives detailed accounts of the use of ferrets in America for rodent control and rabbit hunting. Bissonnette (1950) describes similar uses of ferrets:

> "Tame ferrets raised in America were probably introduced from Europe, where they have been used in hunting rabbits and rats, and for taking ropes through long underground pipes." (p. 234, Bissonnette 1950)

Some authors report that the ferret was introduced into North America much earlier, such as the following example:

> "The domesticated ferret, although introduced to North America by the early English settlers some 300 years ago, has not established feral colonies on this continent." (p. 6, Fox 1988).

Harding (1915) states that the ferret breeding industry started in northern Ohio in a town nicknamed "Ferretville", where annual shipments averaged 20,000 ferrets, and may have peaked at 35,000 ferrets per year. Harding (1915) recounts:

> "The ferret business in America was first launched by Henry Farnsworth, at Rochester, a little village of some 200 inhabitants, a few miles northeast of New London. Realizing a few years later that it could be developed into quite an industry, with his three sons, Levi, Samuel and Ezra, they moved the business to near New London, where the breeding and raising was carried on, on a more extensive scale, raising and selling several hundred if not thousands yearly for some time...New London became and still is the center of the industry. Within a radius of ten miles of New London, half of the ferrets in America are probably raised. New London (Ferretville) is pretty well advertised throughout America as the village where ferrets are raised by thousands. While the industry is one where the demand will probably remain under 200,000 yearly for rat and rabbit purposes, yet as the tens of thousands sold annually go to all parts of America, it puts Ferretville upon the map, so to speak, far and wide." (pp. 25-27, Harding 1915)

Harding (1915) provided excerpts from the United States Department of Agriculture Bulletin 369 entitled "How to Destroy Rats" by David Lantz, including the following:

> "Among domestic animals employed to kill rats are the dog, cat and ferret...Tame ferrets, like weasels, are inveterate foes of rats, and can follow the rodents into their retreats. Under favorable circumstances they are useful aids to the rat catcher, but their value is greatly overestimated. For effective work they require experienced handling and the additional services of a dog or two...Sometimes they remain for hours in the burrows or escape

> by other exits and are lost. There is a danger that these lost ferrets may adapt themselves to wild conditions and become a pest by preying upon poultry and birds." (p. 91, Harding 1915)

According to Kowalski (1976), cats gradually replaced ferrets as the popular animal companion for rodent control. Harding (1915) recounts how ferrets were used in western USA at the beginning of the 20th century by farmers and ranchers to eradicate squirrels, prairie dogs, and gophers. Mannix (1967) gives another example of the early use of ferrets in USA:

> "According to a beloved American tradition, every boy should have a dog. Judging from English literature of the last century, a dog was considered an unnecessary luxury for youngsters, but every boy had a ferret...Although most accounts descriptions of rural life in England contain references to ferrets, I know of no account of their use in America. Yet ferrets were employed in this country on a scale unheard of in Europe, and were even used against such formidable quarry as raccoons, mink, muskrats, and foxes." (p. 90, Mannix 1967)

The survey of North American state agencies conducted for this study provided some additional information on the introduction of ferrets into USA. The survey requested an answer to "The domesticated ferret was first introduced / imported into my State in year:__." or an estimate therein. Several eastern States answered with distant dates of introduction: Virginia and Massachusetts estimated in the "1700's"; Iowa in the "1800's"; New York and Ohio estimated 1900. Other States reported more recent introductions: Minnesota and Montana in 1950; New Mexico and Oklahoma in the 1960s; Washington District of Columbia, Kentucky, North Dakota, in the 1970s; Alaska, Connecticut, Indianan, Maine, and Washington State in the 1980s; Michigan, Rhode Island, and West Virginia in the 1990s. These responses are consistent with the literature that documents two phases of introductions of ferrets into USA: an early, utilitarian phase spanning from the late 18th century to the end of the 20th century; and a recent phase spanning the decades from 1970 to 1990, corresponding to the recent popularity of the ferret as a household pet. Some authors describe this recent increase as a "fad" (Williams 1984) and attribute the ferret's popularity to its repeated appearance in cinema during the same time period: see Schilling (2007) for examples. The ferret's success as a pet may also be due to the creation of effective vaccines for the ferret. The increase in popularity of the ferret as a pet may have recently slowed or diminished, as the American Pet Products Association, Inc. (2010) reports that the percentage of small animal ownership per total USA households has not significantly changed since 1988, the year of their first nationwide survey, and ferrets represent only 8% of this small animal ownership.

Neither ferrets nor polecats are listed in the following regional mammal checklists:

- South America (Lord 2007)
- North America (Whitaker Jr. 1980; Hall 1981)
- Canada (Banfield 1974; Van Zyll de Jong 1983)
- Neotropics (Eisenberg 1989)
- Virgin Islands & Puerto Rico (Philibosian and Yntema 1977)
- Southwest USA (Cockrum 1982)
- Northwest USA (Ingles 1965; Larrison 1976)
- Arkansas (Sealander 1979); Hawai'i (Tomich 1986); New Mexico (Findley *et al.* 1975); Oklahoma (Caire *et al.* 1989); Oregon (Verts and Carraway 1998); Washington (Dalquest 1948; Larrison 1970)

Ferrets are mentioned in the *Introduced, Nonnative Mammals* section in the Arizona state checklist by Hoffmeister (1986); this is discussed later in this report as a case study.

6.2.3. Distribution of Mustelids in California

Mustelids may have arrived in what is now California as early as the Miocene Epoch (Jameson and Peters 2004). Eleven mustelid species are native to California: sea otter (*Enhydra lutris*), distributed along the entire coast of California; wolverine (*Gulo gulo*), distributed in the high Sierra Nevada and Klamath Mountains; River otter (*Lutra* [= *Lontra*] *canadensis*), distributed in the Cascades and Sierras and Central Valley; marten (*Martes americana*), distributed in the Cascades and Sierras; fisher (*Martes pennanti*), distributed in the Cascades and Sierras; skunks (*Mephitis mephitis* and *Spilogale putorius*), distributed statewide except for the southeastern deserts; ermine (*Mustela erminea*) and long-tailed weasel (*M. frenata*), both distributed in the northern half of California and in the coastal ranges; mink (*M. vison*),

distributed in Central Valley and northern half of California; and badger (*Taxidea taxus*), distributed in the Great Basin region and occasionally Central Valley (Jameson and Peeters 2004).

Note, however, that most mammalogists have separated and elevated skunk species to their own family Mephitidae (Dragoon and Honeycutt 1997; ITIS 2010).

The following authors do not list any exotic mustelids in their inventories or checklists of California mammals: Stephens (1906), Ingles (1947), Williams (1979), Laudenslayer and Grenfell (1983), Laudenslayer *et al.* (1991), Trapp (1992), and Jameson and Peeters (2004). Ferrets and polecats are not mentioned in the *Complete list of Amphibian, Reptile, Bird and Mammal species in California* compiled by CDFG (2008). Jurek (2001) does not list ferret or polecat as an established mammal in California. Mooney *et al.* (1986) do not list the ferret or polecat in their list of invasive and naturalized mammals present in California.

6.2.4. Summary and Opinion

The literature suggests that for several thousand years, humans have captively and selectively bred polecats to produce domesticated varieties, called ferret, that served as hunting companions, pets, or for rodent control. Since ferrets are often back-bred with polecats, each ferret lineage may be relatively ancient or modern, and may fall anywhere within the polecat-ferret spectrum in terms of its behavior and fitness. The great majority of the published literature does not consider the ferret or polecat to be an established wild mammal in North America.

7. CENSUSING FERRETS

7.1. WHY IS THE CENSUS OF FERRETS IMPORTANT?

The census of ferrets existing in California, and in the USA in general, is important for several reasons, such as:

- provides important information about potential economic impacts, both beneficial and adverse
- may support pro-ferret arguments or anti-ferret arguments that ferrets do or do not impact the environment
- may be used in risk analyses and cost-benefit analyses
- measure of civil disobedience (*i.e.* number of Californians ignoring the ferret regulations) and relative need for future licensing, monitoring, or enforcement actions

7.2. ESTIMATES FROM PUBLISHED LITERATURE

Estimates for total numbers of pet ferrets in the USA for the last decades of the 20th century range from 275,000 to 10,000,000. Estimates for total numbers of pet ferrets in California for the last decades of the 20th century range from 30,000 to 1,000,000. Not surprisingly, pro-ferret groups tend to give estimates in the upper range, and anti-ferret groups tend to give estimates in the lower range. Many published estimates are cross-citations or re-citations: veterinarians such as Boyce *et al.* (2001) often cite ferret organizations as the source for their population estimates. No published source explained their estimate method or accuracy; in general, empirical data are lacking to back any census or population estimate.

Veterinarian S. Diesch estimated that in 1988, 50,000 ferrets were sold yearly in the United States and 1 million were kept as pets (Paisley and Lauer 1988). Another veterinarian estimated that there were "several million" in the USA (Ball 2002). Nowak (1999) estimated that 1 million pet ferrets are kept in USA; Jeans (1994) estimated 7 million domestic ferrets in US households in 1994. Weisser (1991), citing pro-ferret organizations, estimated 5 to 6 million in USA, and 250,000 to 100,000 in California. Other estimates are provided in the following text copied verbatim:

> Legislators reviewing bill that would eliminate the euthanization procedure when ferrets bite someone in New Hampshire. Representative Robert L'Heureux (R-Merrimack) says that there are about 30,000 pet ferrets in the state and if the new legislation passes, the inoculations could save the lives of many ferrets. Anonymous. 1995. Rabies bill filed on ferrets in N.H. Boston Globe. Boston, Massachusetts, February 16, 1995, pg. 40.

"Ferrets are permitted as pets in all states of the continental U.S. except California, and some observers estimate that there are from 100,000 to 500,000 domestic ferrets kept as pets in California despite the prohibition. A Michigan official noted that Michigan went from zero ferrets (officially, as they were prohibited) to 200,000 overnight when they were legalized a few years ago, and 'they did not all just come in over the state line that day.'[2]

[2] Dr. Stephen Halstead, head of the Companion Animal Program, within the Division of Animal Industry, personal communication, April 4, 1997. " (pages 1-2, Umbach 1997)

"Despite restrictions on their sale, there are an estimated five to seven million pet ferrets in this country." (p. 223, Nagami 2004).

"The commercial production of ferrets on a large scale in the 1930s resulted from a demand by the scientific community to provide a model for vaccine testing and biomedical research in the fields of reproductive physiology, virology, toxicology, and cardiovascular pharmacology. Over the last 5 years, 6,000 ferrets sold annually." (AVMA 1986; Besch-Williford 1987)

"Current estimates place the number of domestic ferrets kept as pets at between five and eight million animals with several million more being used as research subjects." [citing Matulich, E. 2000. Ferret domesticity: a primer. Ferrets USA, pp. 88-95. (p. 698, Boyce *et al.* 2001)

There have been attempts to estimate ferret population by inventorying pet products and extrapolating to numbers of pets:

"Wright says the nation's leading pet industry association reports 27% of ferret supplies sold in the United States are sold in California." (Tone 2007)

"Estimates by ferret breeders and experts place annual sales of the pets at 20,000 to 30,000." (p. 59, Williams 1984)

"Despite their illegal status, between 100,000 and 500,000 domestic ferrets are estimated to live California. The commercial pet industry estimates that more than a quarter of U.S. sales of ferret food and supplies are sold in California." (Ferrets Anonymous 2010)

Several authors suggest that the population of ferrets in USA is increasing:

"The population of pet ferrets is estimated to have grown to two million from 100,000 in 10 years." (Copping 2008)

"Another indicator of popularity is that the number of ferrets confiscated at California's border agricultural check stations has increased through the years from none in 1975 to 210 in 1985-1986, according to state agricultural officials. The total exceeded 200 in 1986-1987 before dropping to the 150 level in 1988-1989. Seized ferrets can be returned to the place of origin, exported to an out-of-state facility that accepts ferrets or may be euthanized, according to Capt. Simon of the DFG." (p. 7, Weisser 1991).

However, the American Pet Products Association, Inc. (2010) reports that the percentage of small animal ownership per total USA households has not significantly changed since 1988, the year of their first nationwide survey.

Jurek (1998) reviewed the literature from both pro-ferret organizations and National Pet Ownership Surveys to try to arrive at an accurate census of ferrets, and gave the following information and summaries:

"In California, fewer than 1,000 ferrets are possessed under State permits by university and medical research facilities and by animal exhibitors. The Department of Fish and Game has made no attempt to estimate the number of illegal ferrets kept as pets and has had no information upon which to calculate a reasonable estimate. Also, no other California agency has made an assessment. During the past 15 years, however, advocates for legalizing ferrets as pets have routinely claimed that hundreds of thousands of California citizens own hundreds of thousands of ferrets. A reasonable estimate of the number of illegal ferrets and owners in California would be

useful to agencies and the public in assessing proposed ferret legalization, including evaluating pros and cons of ferret licensing and assessing risks to public health, animal welfare, agriculture, and wildlife." (p. 1, Jurek 1998)

"Thus, claims by ferret organizations of the number of ferrets existing in the U.S. in the late 1980s were consistently in the range of 5 or 6 million ferrets, which expanded during the 1990s to 7 to 10 million. Ferret organization claims of the number of pet ferrets in the U.S. are not supported by data reported in the major national pet surveys. The nationwide number of pet ferrets reported in one recent, professionally conducted pet ownership survey is only 10 to 20 percent of the numbers claimed in the mid 1990s by ferret organizations.

The American Veterinary Medical Association (AVMA) sponsored its nationwide survey of pet ownership in 1991 and in 1996 (Gehrke, 1997)...The AVMA reported that the number of ferrets in the U.S. was 275,000 in 1991 and 791,000 in 1996 (Figure 1). The rate of ownership (percentage of households owning ferrets) increased from 0.2% in 1991 to 0.4% in 1996, with the number of ferret-owning households increasing from 189,000 in 1991 to 395,000 in 1996.

The American Pet Products Manufacturers Association (APPMA), representing pet supply manufacturers and importers, have conducted National Pet Owners Surveys since 1988. Although the APPMA survey sample size is smaller than the AVMA survey, the APPMA surveys more frequently, every two years, compared with AVMA surveys at four-to-five-year intervals. APPMA's survey in early 1996 indicated that ferrets were owned in about 6% of the 5 million households owning small animal pets, excluding cats and dogs (APPMA, 1996). Thus, approximately 300,000 households nationwide owned ferrets, a significant increase since APPMA's 1992 survey. The number of ferret-owning households was about the same as gerbil-owning households. More households owned, in decreasing order, rabbits, hamsters, and guinea pigs. In each of these respects, the APPMA survey results were quite similar to those of the AVMA." (pp. 3-4, Jurek 1998)

Ferrets are illegal for pet keeping in California and Hawai'i. Also, in other states where ferret keeping is generally allowed, many cities and counties restrict or prohibit ferrets. Underestimations of ferret numbers in the two nationwide pet surveys could arise if significant numbers of survey participants who owned ferrets in areas where they are illegal chose not report having them. U.S. residents living in areas where this animal is prohibited may represent 15% or more of the nation's population (Californians represent 12% of the U.S. population). NFO Research, Inc., the survey organization for both the APPMA and AVMA, assures its survey participants that their responses, whatever the topic in its wide array of consumer-related subjects, are kept in confidence. There is no reason to assume that the AVMA data underrepresent ferret numbers (see http://www.nfor.com/nforesearch.nr_white_papers.html), but even if one would want to surmise a 20% or 25% underestimate, there still would be fewer than one million pet ferrets in the nation, based on the 1996 AVMA figures." (p. 7, Jurek 1998)

"However, the proportion of households owning ferrets in California and the per capita number of ferrets are likely to be lower than elsewhere in the nation, because the California prohibition makes it much more difficult for one to purchase or import ferrets than in other states. Also, it is relatively more difficult than in other states to obtain medical attention for ferrets, and any abandoned, stray, and confiscated ferrets suitable for adoption would be sent out of California." (p. 10, Jurek 1998)

Jurek (1998)'s conclusion is reproduced verbatim here:

"Until better data become available directly from California studies, the only reasonable way to quantify the illegal ferret population in California is to acknowledge that no accurate assessment is possible. However, based on available 1996 national ferret ownership rates and pet population data, there would likely be fewer than, perhaps far fewer than, 100,000 pet ferrets in California." (p. 10, Jurek 1998)

We agree with Jurek (1998)'s statement that, "*There are no data comparing the ownership rate in California with the national rate.*"

7.3. ESTIMATES FROM SURVEYED AGENCY PERSONNEL

Jurek and Ryan (1999) asked their respondents to tabulate the number of legally-possessed ferrets in their State; the results are copied verbatim here:

> "Estimated Number of Legally Possessed Ferrets. Forty states (80%) indicated that the number of legally possessed ferrets was 'Unknown', or they gave no response, or listed as not applicable. Hawai'i listed the number as zero, and nine states estimated or listed totals ranging from 150 to over 20,000. Fourteen states indicated that there were no legal hunting ferrets (Appendix B-6). The nine states that estimated populations of legal ferrets gave the following numbers, according to categories of use (a question mark listed below means that '?' was part of the answer used by respondent on the form. An asterisk (*) indicates that more detailed information is given in Appendix B-6):

State	Total	Pets	Breeding Stock	Lab Animals	Hunting Ferrets
Alaska	300	300	?	?	0
Arizona	10,000*	9,500?	500?	?	0
California	< 500	0	0	< 500	0
Illinois		> 671*	unknown*	prob. < 100	prob. 0
Kentucky	150	35*	25*	0	0
Massachusetts	~2,000*	~2,000*	0*	100-200	0
New Jersey		20,000*	unknown	2,000	0
New York		----------6,000*----------			
Rhode Island		pets: several thousand			

(p. 9, Jurek and Ryan 1999)

Unfortunately, Jurek and Ryan (1999) did not ask their respondents to estimate the total number of ferrets in their State, both legally and illegally possessed. As well, many respondents did not have any empirical data to answer the question, and decided not to provide any answer all.

In our study, this survey question was modified and made more general: "*Please estimate the total number of domesticated ferrets in your State*". It was anticipated that many respondents would lack empirical data to give a specific numerical estimate, so an additional response choice was offered: "*Can't say precisely, but my professional estimate of the range of domesticated ferrets that exist in my State is: 1 to 1,000 ferrets; 1,000 to 10,000; 10,000 to 100,000; greater than 100,000*". No State agency respondent gave a firm estimate or census of ferrets in their State based upon empirical data. However, most State agency biologists were comfortable with estimating the pet ferret population in their State to the nearest order of magnitude. The results are as follows:

Can't say precisely, but my professional estimate of the range of domesticated ferrets that exist in my State is:					
State Response	Don't Know	Est. 1 to 1,000	Est. 1,000 to 10,000	Est. 10,000 to 100,000	Totals
	ID, IL, LA, NC, NE, NJ, NV, OH, OR, TX, UT	AK, DC, DE, HI, IA(2)*, KY, OK, MT, NY, SD, WA, WV, WY(2)	AL, AZ, CO, CT(2), GA, MA, MD, ME, MI, MS, ND, NJ, NM, OK, PA, SC, VI, VT, WA(2), WI	CA, IN, MN, NY	
Lower Bound	0	13 x 1	20 x 1,000	4 x 10,000	60,013
Upper Bound	0	13 x 1,000	20 x 10,000	4 x 100,000	613,000

**Note: when more than one agency in the same State responded to a question, we noted the tally in parentheses. For example, "IA(2)" indicates that two different Iowan agency personnel responded, and both indicated that they estimated 1 to 1,000 ferrets in their State. These duplicates were not counted twice in tallies.*

From this partial response to our survey, we have a lower bound of about 60,000 and an upper bound of about 600,000. Since no State agency personnel estimated a ferret population of greater than 100,000 in their State, we could extrapolate that the upper bound in all 50 States is 5 million (50 x 100,000) ferrets. However, since the majority of State agencies responded in the range of 1 to 10,000, the lower bound might be 500,000 (50 x 10,000). A more reasonable inference from the questionnaire data is a USA ferret population of about 1 million.

In his response to the CSUS questionnaire, Dr. Kent Fowler (California Department of Food and Agriculture) checked the answer: "*Can't say precisely, but my professional estimate of the range of domesticated ferrets that exist in my State is: 10,000 to 100,000*". Based upon the literature reviewed and the responses received from California agency personnel, we feel that a range of 50,000 to 100,000 ferrets within California is a fair estimate.

Three Canadian agencies responded: New Brunswick and Nova Scotia agency personnel both responded "*estimate 1 to 1,000*"; and British Columbia responded checked box = "*Domesticated ferrets are not known to exist in my State*".

7.4. ESTIMATES FROM THE PET TRADE INDUSTRY

In their 2009-2010 survey, the American Pet Products Association, Inc. (2010) reported that in the USA, 5.3 million USA households owned small animal pets (this category included ferrets), translating into 5% of the USA population owning a small animal pet; this represents a decline from the last survey period in 2008. The total number of small animal pets owned in the USA in 2009-2010 was 15.9 million, with 42% being rabbits, 30% hamsters, 15% guinea pigs, and 8% ferrets. Thus, the American Pet Products Association, Inc. (2010) estimated, indirectly, the total number of pet ferrets in the USA at 1.3 million (= 8% of 15.9 million small animal pets). It was also reported that ferret owners have an average of 2 ferrets per owner, the average purchase cost of a ferret was $123, and regardless of which species of the small animal owned, the average length of time as an owner was slightly less than 2 years (American Pet Products Association, Inc. 2010).

Census data was requested of Marshall Pet Products, Inc., the largest ferret breeder in North America. Their response was as follows:

> "We estimate that ferret sales are in the range of 150,000 animals each year....the numbers for research would be about 10-15% of that" (Paul Juszczak, Director of Sales, Marshall Pet Products, pers. comm., 2010).

Some authors claim incorrectly that ferrets are the third most popular pet in the USA, after dogs and cats: provided are two excerpts of this claim:

> "Ferrets are among the top-three popular pets in the United States....They must have human contact every day with anyone the age of 12 or older; children younger than 12 can harm ferrets. Yes, some ferrets do nip at you...ferrets stay like kittens all their life, right up to their death about ages 5 to 8 years old in the Florida environment." Anonymous. 2008. Ferrets can learn not to nip. Orlando Sentinel. Orlando, Florida. November 25, 2008. Pg. A16.
>
> "Considered the third most popular pet in the United States..." (p. 697, Boyce *et al.* 2003)

These authors give no evidence to support their claim, and this is not supported by annual reports provided by pet product manufacturing associations. In the 2009-2010 survey, the American Pet Products Association, Inc. reports that in the USA, 71.4 million households owned pets, split as follows: 39% owned a dog, 33% own a cat, 12% owned a fish/bird/equine; 4% owned a reptile; and 5% owned a small animal (with ferrets representing 8% of this small animal category, while 42% were rabbits). Thus, the third most popular pet is probably a fish, bird, or horse.

7.5. SUMMARY AND OPINION

The enumeration of ferret populations, both as pet and laboratory subject, in USA and California is important for many reasons. No scientific census of ferrets has ever been performed in the USA; all existing estimates are based upon opinion or extrapolation of pet owner surveys or ferret product sales. Published estimates for total numbers of pet ferrets in the USA for the last decades of the 20th century range from 275,000 to 10,000,000. Estimates for total numbers of pet ferrets

in California for the last decades of the 20th century range from 30,000 to 1,000,000. In 2010, the American Pet Products Association, Inc. estimated, indirectly, the total number of pet ferrets in the USA at 1.3 million (8% of 15.9 million small animal pets). Based upon crude extrapolations from our literature review and CSUS questionnaire, we estimate a USA pet ferret population of about 1 million, and a California pet ferret population between 50,000 to 100,000.

8. ANALYSIS OF POTENTIAL WILDLIFE ISSUES

8.1. REASONS FOR CONCERN

California, and specifically, the California Floristic Province, is considered by most conservation biologists to be among the World's megadiverse regions, as well as a global hotspot (defined as megadiversity under imminent threat)(Stein *et al.* 2000). Impacts from invasive species are second only to habit loss in worldwide biodiversity loss (Stein *et al.* 2000). Mooney *et al.* (1986) described California's situation:

> "California is a land of unusual biotic diversity. It comprises a wide range of indigenous ecosystems including a diversity of forest, woodland, scrub, and grassland types as well as numerous kinds of aquatic ecosystems...The nature of these ecosystems is very different today than it was several hundred years ago. All have been impacted to varying degrees by anthropogenic influences...Here we focus on a particular class of ecosystem change that has been induced or greatly accelerated by the activities of humans, that of the introduction of exotic organisms. These introductions have, in certain cases, resulted in readily observable changes in ecosystem structure and hence function. In most cases, however, the ecological impact of these introductions is subtle and has not yet been determined." (p. 250, Mooney *et al.* 1986)

> "In California there are 216 species of mammals, at least 11 of which are confirmed naturalized species with six additional questionable establishments (Williams 1979)(Table 15.1). The naturalized species include the Virginia opossum (*Didelphis virginiana*), Norway and black rat (*Rattus norvegicus* and *R. rattus*), house mouse (*Mus musculus*), gray squirrel (*Sciurus carolinensis*), fox squirrel (*S. niger*), wild burro (*Equus asinus*), wild horse (*E. cabullus*), wild pig (*Sus scrofa*), Barbary sheep (*Ammotragus lervia*), and Himalayan tahr (*Hemitragus jemlahicus*)...The ecological impact of certain of the introduced mammals has been well documented as noted below. On the other hand there is very little information on the impact of pet mammals on the native fauna." (p. 254, Mooney *et al.* 1986).

Hawai'i and tropical Florida are also part of regions of megadiversity and global hotspots. South Florida has 44 mammal species, 10 of which are exotic species; the nine-banded armadillo (*Dasypus novemcinctus*) is given as a "*notorious*" example (Ewel 1986). Ewel (1986) explains further:

> "South Florida contains more conspicuous introduced plants and animals than any other region in the continental United States. At the same time the region also encompasses one of the largest contiguous complexes of preserved ecosystems in the eastern U.S." (p. 213, Ewel 1986)

At least 4,552 exotic species have established free-living populations in USA, 142 of which were terrestrial vertebrates (Office of Technology Assessment 1993).

Islands are particularly sensitive to exotic species invasions for a variety of reasons: Moors (1983) summarizes this issue thoroughly using New Zealand as a case study. Courchamp *et al.* (2003) provides this summary of potential impacts:

> "The invasion of ecosystems by exotic species is currently viewed as one of the most important sources of biodiversity loss. The largest part of this loss occurs on islands, where indigenous species have often evolved in the absence of strong competition, herbivory, parasitism or predation. As a result, introduced species thrive in those optimal insular ecosystems affecting their plant food, competitors or animal prey. As islands are characterised by a high rate of endemism, the impacted populations often correspond to local subspecies or even unique species. One of the most important taxa concerning biological invasions on islands is mammals. A small number of mammal species is responsible for most of the damage to invaded insular ecosystems: rats, cats, goats, rabbits, pigs and a few others. The effect of alien invasive species may be simple or very complex, especially since a large array of invasive species, mammals and others, can be present simultaneously and interact among themselves as well as with the indigenous species." (p. 347, Courchamp *et al.* 2003)

Atkinson (2001) discusses the concept of "mainland islands", which are intensively managed areas such as nature preserves that are targeted for ecological restoration, and specifically, the removal of non-native mammals. Several authors, including Jurek (2001), suggest that California may function as an island. However, the comparison of California to islands lacking native predators is not fully valid; twenty native species of terrestrial carnivores in California (Jurek 2001), 11 of which are mustelids.

The following excerpts are provided to summarize some of the issues involved in the introduction of exotic predators:

> "Pimm (1987) suggested that the impacts of exotic species on invaded systems should be most severe when (1) species are introduced into predator-free areas; (2) polyphagous species are introduced; and (3) species are introduced into relatively simple communities. Vitousek (1990) suggested that invaders can change ecosystems when they '(1) differ substantially from natives in resource acquisition or utilization; (2) alter the trophic structure of the invaded area; or (3) alter disturbance frequency and/or intensity'... It is difficult to predict which exotic species will become pests following invasion because resources exploited in the new environment may differ from those exploited in the native range (Bateman, 1977). Such changes in resource use may result from interspecific interactions in the invaded community (Bateman, 1977) or from genetic changes among the invaders (Howard, 1965; Ehrlich, 1986; Mooney et al., 1986)." (p. 150, Smallwood and Salmon)

> "Most introductions of species into new habitats are failures (deVos & Petrides, 1967). For example, of the 150 or so species of birds introduced to Hawaii, and of the 145 introduced to New Zealand, 'only' 30 and 36 have become established, respectively (Roots, 1976; Veitch & Clout, 2001). This relates to what has been termed the '10's rule': approximately 10% of introductions succeed and approximately 10% of these will be significantly ecologically disruptive (Williamson, 1996)..... It is generally very difficult to assess the impact of an introduced species on the ecosystem it has invaded (Parker et al., 1999). In most cases, data are not available to compare communities before and after the invasion." (p. 349, 350 Courchamp *et al.* 2003)

> "The concept that mammalian predators are an effective and important agent for controlling undesirable animal populations is almost as old as agriculture. Some success has been achieved in temporarily lowering pest numbers, particularly in island situations. However, the destruction of non-target prey species by the introduced predators far outweighs any advantage gained by these attempts at biological control (Pimentel 1955; Howard 1967; Uchida 1968; Tomich 1969)." (p. 125, Sullivan and Sullivan 1980)

8.2. LIFE HISTORY TRAITS OF IDEAL INVADERS COMPARED TO FERRETS

8.2.1. Life History Traits of Ideal Invaders

The characters of a model invasive species include: commensal or mutualist relationship with humans; omnivory and ability to live in a wide range of physical environments; relatively long life span and short reproductive cycle; competitive superiority over genetic relatives; larger size than competitors, and successful in its native range; male not needed for colonization after fertilization of female; 'predator release' in new environment; and high genetic variability (Ehrlich 1986; Newsome and Noble 1986; Bomford and Hart 1998).

According to Forsyth *et al.* (2003), the process of biological invasion involves at least 4 stages:

> "(1) transport, the movement of an exotic species from its source range to the new environment; (2) introduction, release or escape from captivity; (3) establishment, the transition from captive or escaped individuals to a self-sustaining wild population; and (4) spread, the expansion of geographical range beyond the point of release or escape." (p. 558, Forsyth *et al.* 2003)

Three factors increase the probability of establishment of an exotic species: the number of individuals released and the number of release events; the degree to which the new habitat matches the climate of the introduced species' native habitat; and life history traits that encourage colonization (Forsyth *et al.* 2003).

8.2.2. Life History Traits of Ferrets

King and Moors (1979) compared the life histories of 6 mustelids, and concluded that polecats (*M. putorius*) were in the middle of the continuum of *r*-selected strategists such as weasel and stoat *k*-selected strategists such as otters (*Lutra lutra*) and badgers (*Meles meles*); the excerpt is provided:

> "The European polecat has some of the characters of both groups: it is larger than the r-strategists but matures earlier and has larger litters than the K-strategists. Very little is known about the population dynamics of the wild polecats, but the available information indicated that it occupies a center position in the r-K series." (p. 620, King and Moors 1979).

See MacArthur and Wilson (1967) for a definition and discussion of *r*- and *K*-selection life history theory.

Some of the life history traits of ferrets are known, and discussed by authors such as King and Moors (1979) and Clapperton (2001). New Zealand biologists have performed the most extensive studies on population dynamics of ferrets (e.g. Lavers 1973). Byrom (2002) studied the dispersal and survival of juvenile feral ferrets in New Zealand. Clapperton (2001) summarized the population dynamics of feral ferrets, including estimates of mortality, recruitment, and age-specific survivorship.

The following authors suggest the ideal conditions for establishment of a feral ferret population:

> "Perfect conditions for establishment of a feral ferret population would accommodate their biological limitations. The ideal region for introduction would have moderate climate, a superabundance of preferred prey (rabbits or possibly rats, *Rattus norvegicus*) and be devoid of competitors and possible predators. The ferret population introduced would be large and the introductions repeated frequently." (p. 4, Fitzgerald, unpub. report).
>
> "However, wild polecats are surprisingly tolerant of human activity, and often inhabit the vicinity of settlements or rabbit burrows where they may meet domestic ferrets (JDSB unpub. data; Blandford, 1987; Weber, 1989). Since domestic ferrets have been selectively bred in captivity for hundreds of years (MacKay, 1995), the resulting qualities of docility and tameness may limit the capacity of ferrets to survive and breed in the feral state (Poole, 1972). These circumstances will favour strong selection for a polecat 'phenotype', and may explain why the enduring feral ferret colonies are found on offshore islands where native predators are scarce or absent (Blandford and Walton, 1991)." (p. 159, Davison *et al.* 1999).

Ferrets for Dummies provided the typical argument made by pro-ferret groups against the possibility of ferrets establishing feral breeding populations in the wild:

> "Feral ferrets in my neighborhood? Perhaps the most outrageous misconception about owning ferrets—or unfounded paranoia, actually—is the fear that pet ferrets will escape, unite in the wild, form large feral (wild) colonies, and develop their own organized crime rings. Okay, maybe I'm exaggerating a bit. But some governmental suits actually believe the part about the development of feral colonies. These politicians preach the idea that these colonies of roving feral ferrets will destroy native wildlife and livestock. Here are some reasons why the feral-ferret scenario is very unlikely:
>
> - Ferrets are domestic animals (see the previous section), and they rely on humans for survival.
> - The majority of ferrets entering the pet trade are spayed or neutered.
> - Ferrets are indoor pets and escape is unlikely.
>
> Many species of domestic animals are capable of going feral, but for a colony to form, their environment has to be just perfect for them, and they have to have the necessary skills. In particular,
>
> - There must be several feral breeders around to make more animals.
> - There must be an open niche. North America has few open niches left for small predatory mammals such as the ferret. The niches are already filled with more competitive mustelids (a ferret's cousins), such as the American mink and the long-tailed weasel.
> - The animal must know how to escape from predators and find food.
>
> These are just a few of the many reasons why the likelihood of ferrets taking over your environment is very small." (pp. 42-43, Schilling 2007)

Herman (2000) represented the pro-ferret argument well, and the excerpt is provided here:

"One of the main considerations regarding the legalization of ferrets (and their classification as domestic and not wild animals) is the likelihood that these animals may escape and form feral colonies, thus ravaging the local wildlife and especially harming endangered animals. Several studies have addressed feral ferrets, and an application of their findings indicates that the menace to California's wildlife by feral ferrets has been exaggerated.

The key studies of feral ferrets center on New Zealand; thousands of ferrets were introduced there in the late nineteenth century to control the rampant increase in feral rabbits (themselves descendants of rabbits brought with the English settlers less than a half-century earlier). By 1900, ferrets had become established in the wild, and eventually the New Zealand government considered them pests. The California Department of Fish and Game has cited the New Zealand feral ferret experience as a justification for banning ferrets. Similar studies on feral ferret populations on San Juan Island (Puget Sound, Washington) have also been cited by the CDFG. Reports of feral ferrets have also been generated in the Australian state of Queensland, where ownership of ferrets is illegal. Feral ferrets were also reported from New Mexico in the mid-1980s. As in New Zealand, the New Mexico ferrets were the offspring of animals that had been purposefully introduced in large numbers to control 'pests' (in this case, prairie dogs).

Yet the concerns raised by these studies and reports are largely inapplicable to California. In fact, the studies actually alleviate fears of the potential of ferrets for destroying wildlife in general and birds in particular.

First, New Zealand is a self-contained island ecosystem, about 1000 miles from the nearest continent, without any large native predators that could control the ferret population (i.e., domestic dogs and domestic cats, as well as birds of prey and other forms of wildlife). The same is true to a lesser extent in Australia, where the only predatory carnivore that predates the European settlement is the dingo (the feral descendant of dogs brought to Australia by the aborigines). In the absence of such apex predators, ferrets are more likely to thrive in the wild. Second, the European settlers and their dogs, cats, and other imported animals had become the primary destroyers of wildlife before the introduction of ferrets. As one researcher has noted, 'The mustelids [i.e., ferrets and weasels] cannot be proved to be directly responsible for any of the long list of island populations of birds that we know to have gone extinct since the human colonization of New Zealand.' Third, at least one study has indicated that ferrets would not be a menace to birds, since examinations of wild ferrets show that birds comprise only a small percentage of the ferret diet, with the bulk being made up of rabbits and hares.

In addition, the appearances of feral ferrets in New Zealand and New Mexico are the result of an introduction of ferrets for a purpose other than pet ownership—namely, as a form of alternative pest control. As large numbers of these animals were systematically turned loose to kill populations of animals considered to be pests, their odds of establishing feral colonies would presumably be much higher than for ferrets that are kept as housebound pets. However, the CDFG has not specifically addressed the differences in potential havoc between the occasional escape of pet ferrets, as opposed to systematic releases.

By contrast, the domestic cat (*Felis domesticus*), whether living as a pet or running loose in feral form, exceeds the ferret in its danger to wildlife, primarily birds. Each year in the United States, cats kill hundreds of millions of migratory songbirds; a report by ornithologist Stanley Temple of the University of Wisconsin estimated that at least 20 million—and perhaps as many as 150 million—songbirds are killed by cats every year in rural Wisconsin alone. Another estimate placed the daily kill of songbirds by cats in the United States at 4.4 million.

The domestic cat, like the ferret, is a non-native predator in California; the U.S. Fish and Wildlife Service reports that 'feline predation is not "natural" . . . The "tabby" that sits curled up on your couch is not a natural predator and has never been in the natural food chain in the Western Hemisphere.' Indeed, cats—like ferrets—were originally imported into America as 'working' animals (to control rats and other pest animals), prior to breeding and ownership as household pets.

A report by University of Wisconsin researchers states that 'worldwide, cats may have been involved in the extinction of more bird species than any other cause, except habitat destruction' and lists several bird species whose existence is currently threatened by cats, including least terns and loggerhead shrikes. The Wisconsin report also noted that cats introduced to Florida's barrier islands have nearly destroyed several unique rodent species. By contrast, CDFG's concern over escaped ferrets wreaking havoc on least terns is countered by correspondence from the Massachusetts Department of Fisheries & Wildlife that states that 'there has never been a recorded case of tern predation by a ferret in Massachusetts . . . in fact, I have never heard of such a case anywhere in North America.'

Furthermore, the hunting effectiveness of domestic cats, which rivals the efficiency of wild predators, is enhanced by the inability to suppress the desire to hunt with adequate supplemental food; "even when fed regularly by people, a cat's motivation to hunt remains strong, so it continues hunting." Indeed, well-fed domestic cats, not needing to hunt for survival, can wait patiently for birds and other hard-to-catch prey to wander into range. The steady food supply from people, whether owners or other well-intentioned cat lovers, helps keep cat populations high at times when populations of regular prey animals are low (thus triggering declines in natural predator populations), and allows cats to continue to hunt common and rare species alike.

Cats can compete with native predators, and eat many of the same prey species. Also, cat densities are greater and are often not limited by territory. Some parts of rural Wisconsin have as many as 114 cats per square mile—a density several times greater than all midsized native predators combined.

In the context of this statistical evidence on cats, CDFG's fears of escaped and hungry ferrets multiplying quickly and destroying rare birds and other endangered species seem exaggerated. The ferret diet, when compared to that of cats, is skewed heavily toward rabbits and hares, and small rodents, the sort of prey species that cats would also pursue, in addition to the bird species that cats catch more successfully than ferrets. Cats make the transition to feral life more easily than ferrets, as evidenced by the difficulty in finding feral ferret populations in areas that were neither (a) islands without competing natural predators nor (b) heavily 'seeded' with ferrets in order to control various animals considered pests. Therefore, a ban on ferrets based on their potential threat to endangered and other native species would be ineffective without a concurrent prohibition of cat ownership because of their well-documented destruction of bird populations." (p. 44-48, Herman 2000).

Pro-ferret organizations also make the argument that thousands of ferrets already exist in California, but have done no documented harm to wildlife and have not established any feral breeding populations. Some excerpts from the literature are presented here:

"Wright says despite the domestic ferret's illegal status, thousands of people keep ferrets as pets in California, and have done so for many years with no discernible ill effects on agriculture or the environment." (Tone 2007)

"Another misconception is that ferrets will establish in the wild. Ferrets have been in the United States in large numbers for over 300 years and have never been able to do this. There are no wild ferret colonies anywhere in the world. Errors probably stem from confusing the domestic ferret (*Mustela furo*) with the American black-footed ferret (*Mustela nigripes*)." (Morton and Morton 1995)

Marshall Farms Group, Ltd., has been breeding ferrets for over 70 years for the pet and research industries, apparently without any accidental release of ferrets into the environment (Marshall Farms Group, Ltd., pers. comm., 2009). Marshall Pet Products' argument is similarly stated:

"The Montezuma Wildlife refuge is only about 30 miles from our breeding facility and we are located right on Lake Ontario. Both areas have some of the largest concentrations of breeding water fowl in the country. We know of zero problems with ferret's destroying nests or preying on nesting fowl. The populations of most or all of these birds is exploding." (Paul Juszczak, Director of Sales, Marshall Pet Products, pers. comm., 2010).

Other authors suggest that ferrets are unfairly regulated as wildlife, and that many dangerous wildlife species are not regulated at all. Provided here is an example:

> "...many dangerous animals can be imported or possessed in California without a permit, even though they are neither domesticated nor ever could be. For instance, there is no provision in Fish and Game Code section 2118, or in title 14, section 671 of the California Code of Regulations, prohibiting possession of a pet rattlesnake in California, even though rattlesnakes are wild animals posing a menace to public safety. In fact, six different rattlesnake species may be legally possessed in California, because they are 'natives,' even though they are some of the most aggressive and dangerous animals in the Western Hemisphere. Thus, one can own a rattlesnake in California without any interference from the state, unless the snake bites someone." (p. 50, Herman 2000)

Umbach (1997) provides the following argument:

> "3. Hazard to wildlife
>
> DFG Views
>
> The Department of Fish and Game has asserted that domestic ferrets may escape their homes, form feral colonies, and prey on native wildlife. The Department also asserts that ferrets may carry diseases that could threaten native wildlife.
>
> Ferret Proponents' Response
>
> Proponents respond that ferrets do not ordinarily survive more than about 3 days outside the home and are not known to have established feral colonies anywhere without substantial, concerted efforts to create such colonies.
>
> Evidence and Discussion
>
> Robert S. Ellarson, of the University of Wisconsin, asserts in the article 'Ferrets' in Encyclopedia Americana that ferrets do not survive more than about 3 days in the wild. Some experts believe on the basis of observation and experience that ferrets could survive longer than 3 days, but that survival would be in weeks, not months. One wildlife biologist, however, did assert that he has seen the killing ability and instinct in ferrets personally, and offered the opinion that individual ferrets could survive and predate. Dean Biggins, a leading expert on the black-footed ferret and project leader for the blackfooted ferret project, U.S.G.S. Biological Resources Division, did explain how difficult it has been to reestablish those animals in the wild, even though they are much closer to their wild progenitors (in terms of generations in captivity) than are domestic ferrets. He noted that ferrets keep their ability to hunt and kill better than the ability to elude predators. He asserted that escaped domestic ferrets (like the black-footed ferrets) are more likely to become prey than to survive long as predators in any area with predators (including cats and dogs). The latter point bears on the feral colonies of ferrets in New Zealand. Ferrets (and other predators) were introduced there to combat unwanted rabbit populations. The feral colonies could be established and maintained there because of a lack of predators that in other places would kill the ferrets. New Zealand, therefore, differs from the United States. In the United States, ferrets would likely fall prey to cats, dogs, various wildlife, and even some raptors (birds of prey, such as hawks). Discussions (by telephone) with personnel in Arizona, Colorado, Florida, Massachusetts, Michigan, South Carolina, and Wyoming elicited no evidence of feral colonies of ferrets or of any significant survival of the animals in the wild, nor of reported impact on native wildlife caused by escaped domestic ferrets. This is consistent with the reports from various state wildlife agencies included in the California Domestic Ferret Association compilation.
>
> Conclusion
>
> It appears improbable that domestic ferrets could establish feral colonies in California, given the risks of ferrets themselves being prey. While individual ferrets might survive up to a few weeks in the wild, they are very unlikely to survive longer than that. Despite the lack of documented examples, the possibility cannot be excluded that escaped ferrets might do significant damage to wildlife, such as ground-nesting birds, and possibly including endangered species, during a period up to a few weeks of survival, even without establishing continuing colonies. Ongoing releases or escapes of domestic ferrets might replenish the population in the wild, even if the animals were not reproducing, and this could contribute to a continuing hazard to wildlife. Ferrets would be less likely to pose a hazard of 'going feral' if (1) sales of ferrets within California were limited to licensed breeders and suppliers; (2) ferrets were required to be spayed or neutered (possibly with a registration requirement to encourage

compliance); (3) any pet ferret brought into the state (not purchased from a recognized, in-state breeder or supplier) were required to be spayed or neutered (and registered, if appropriate); and (4) a public education campaign were conducted within the State to inform Californians of proper care for ferrets, including the importance of keeping them indoors or under proper supervision when outdoors, and the requirement that they be spayed or neutered. No one can predict with certainty whether ferrets would damage native wildlife in California. California Department of Fish and Game wildlife biologist Ronald Jurek noted that even 20 years ago, the red fox, which was introduced into the state (though not as a domestic animal) a century ago, was not viewed as a threat, although it has clearly become one since." (pages 4-5, Umbach 1997)

Obviously, sterilized ferrets cannot establish breeding populations. But not all ferrets currently within California are sterilized. It is not true that only sterilized ferrets are available on the pet market. Fertile ferrets are advertised for sale on various Internet websites. An entire chapter of *Ferrets for Dummies* explores the question "*Should you breed your ferret?*" (Schilling 2007). The State of California has not been able to stop the importation of ferrets with the current restrictions in place and with its current policing forces; how will the State ensure that no fertile ferrets are imported into California in the future with legalization? Thus, some risk of ferrets establishing feral breeding populations still remains; no author or scientist has been able to convincingly enumerate that risk.

And while it may be true that ferrets made available through the pet trade do not possess the necessary traits to become an invasive species, polecat-ferret hybrids and polecats may have these necessary traits. The State of California has not been able to stop the importation of ferrets with the current restrictions in place and with the current policing forces; how will the State ensure that no polecat-ferret hybrids or polecats are imported into California in the future with legalization? Like wolf-dog hybrids, some ferret owners may wish to have a more unique animal than the common pet ferret stock produced by companies such as Marshall Farms. Polecat-ferret hybrids are advertised for sale on various Internet websites.

Ferrets for Dummies discusses the hybrid topic, as follows:

"The subject of ferret hybrids is a hotly debated topic in many ferret circles. Very simply put, a hybrid is a cross between a domestic animal and its wild counterpart—in this case, a ferret and a polecat...You must examine what it is that makes people attracted to the ferret hybrid in the first place....Some argue that if done responsibly and correctly, hybrid breeding can enhance existing ferret bloodlines and make ferrets healthier, hardier, and sounder by introducing polecat blood into the mix." (p. 27, Schilling 2007)

"A hybrid ferret certainly has some benefits:

- A hybrid is a beautiful animal. They often bear beautiful, dark markings and have stocky, muscular bodies.
- Hybrids have much better eyesight than non-hybrids, and they rely more on eyesight than domesticated ferrets do.
- They have extraordinary physical capabilities.
- They are very dominant and independent in most situations....

The cons of hybridization. Most ferret-polecat offspring—especially those with a high percentage of polecat blood—display the characteristics of the wild polecat, which certainly isn't favorable in a captive environment. Hybrids, in general, display the following characteristics:

- They're shy and fearful of humans.
- They're less social and less willing to live in groups...
- They don't tolerate new people or being held, and they're quick to bite if they feel uncomfortable.
- They don't tolerate being caged very well; they need a lot of room to roam and explore on a daily basis. Ferret-proofing can be quite challenging, and the result is that hybrids are very accident-prone in a household..."

(pp. 27-28, Schilling 2007)

Thus, any ferret legalization actions may need to assure CDFG that there is no possibility that hybrids or polecats are imported into California, or demonstrate that hybrids and polecats do not pose a threat to the environment if they are released into the wild.

8.2.3. Ferret Life Expectancy and Reproductive Potential

Life expectancy is 5 to 8 years, with some ferrets living up to 10 years (Applegate 1998; Boyce *et al.* 2001; Ball 2002); Bowen (1997) claims pet ferrets may live up to 14 years. Some authors report that captivity may increase the lifespan, such as the following excerpts:

> "...good nutrition probably can lengthen a ferret's lifespan from the eight years common today to 10 or 12 years." (p. 60, Williams 1984).

> "Ferrets in captivity can live for 8-14 years, but probably no more than 4-5 years in the wild." (p. 328, King 1999)

> "Two major concerns are that animals produced in captivity will not be able to adapt to natural conditions and that reintroductions will be disruptive to remaining wild populations. The first concern is especially significant for a predatory species like the black-footed ferret whose survival skills may be culturally transmitted....The second problem of disruption to remnant wild populations does not currently apply to the black-footed ferret..." (p. 212, Foose 1989).

> "Domestic ferrets will not survive long in the wild. As pets, they can live from 6-10 years. There are a few diseases and disorders that can shorten the life of domestic ferrets if not treated. Some of these diseases and disorders include: canine distemper, feline distemper, rabies, parasites, bone marrow suppression, insulinoma, adrenal gland disease, diarrhea, colds, flus, ringworm, heat stroke, urinary stones, and cardiomyopathy. (Kaytee 2001, MNAALAS date unknown, Schilling 2001)." (p. 2, Duda 2003)

Ferrets are susceptible to many diseases and infections (see reviews by Ryland and Gorham 1978, Fox 1988, and Schilling 2007), and this susceptibility makes this pet expensive to own and it shortens its average lifespan (Schilling 2007).

The ferret is considered polyestrous, and can produce 2 litters per year (Seal 1989); some literature suggests that ferrets may produce more than 2 litters per year. *M. putorius* are capable of breeding at 10 to 11 months of age for males, 7 to12 months for females (Mead 1989). Litter size is 2 to 12 (Mead 1989; Murphy 1989). Some authors suggest that domesticated / captive populations may have greater reproductive success, such as the following:

> "The wild European ferret however, usually produces only one litter, while the domesticated ferret produces two or more litters yearly." (p. 6, Fox 1988).

> "It is possible to produce two litters per jill per season under natural lighting...With manipulation of artificial light, a jill may produce 3 or 4 litters." (p. 1158, Besch-Williford 1987)

> "The breeding season is relatively short in most females that produce a single litter each year, lasting only 1 to 2 months, but is prolonged in species such as *Mustela putorius* and *M. nivalis* that can produce 2 or more litters yearly." (p. 124, Mead 1989).

Female ferrets, known as jills, have certain physiological challenges relating to their reproductive system:

> "Jills are induced ovulators, meaning that they remain in heat indefinitely if they are not bred or otherwise stimulated to ovulate. Ferrets are unique in that many of these in persistent estrus would die within 2-3 months if left unbred, because the chronically high estrogen levels can cause bone marrow depression. Jills in prolonged estrus may die of hemorrhage due to thrombocytopenia, severe aplastic anemia, or infections induced by leukopenia...The most effective means of avoiding this problem in a nonbreeding female is to spay the jill before puberty" (p. 39, Ball 2002)

> "The DHS report [referring to Constantine and Kizer 1988] noted that unless they are bred or neutered, half the females will die from hypoplastic anemia, a fate associated with their reproductive process. Unless bred or spayed, female ferrets continue to ovulate. Ovulation induces high levels of estrogen in their blood streams, which depresses their bone marrow and leads to anemia. 'It's a constant problem,' says DFG veterinarian Dave Jessup. When combined with the relatively short life span of ferrets (about half that of cats and dogs), this mortality risk may render ferrets less desirable as pets than other common pet species, the report said." (p. 8, Weisser 1991).

Sterilized ferrets are commonly offered in pet stores. *Ferrets for Dummies* suggests the following statistic:

> "About 85 to 90 percent of the ferrets sold into the pet trade in the United States are altered and descented at weaning and are therefore unbreedable." (p. 332, Schilling 2007)

However, there are many private breeders that offer non-sterilized ferrets. *Ferrets for Dummies* provides advice on finding and using private breeders, but offers this advice:

> "If you love ferrets (and presumably you do if you want to breed them), you don't want to bolster the need for shelters...As ferrets gain popularity as companion pets in households, the number of furballs that wind up in shelters also increases, as does the number of deaths of these homeless fuzzies. Careless breeding by humans is the cause for overpopulation. The population of fuzzbutts at ferret shelters such as the Greater Chicago Ferret Association can fluctuate between 60 and 100 ferrets at a time. That's a lot of displaced furkids. Many are geriatric fuzzies that no longer fit into the perfect pet mold their humans have illogically created. These unfortunate souls get dumped for younger or different pets...Some people even dump fuzzies into the wild to futilely fend for themselves." (pp. 335-336, Schilling 2007)

Pro-ferret authors make the argument that since black-footed ferrets raised in captivity had difficulty establishing breeding populations in the wild, so would escaped domestic ferrets. Russell *et al.* (1994) report limited reproductive success in black-footed ferrets raised in captivity and then released into their native range:

> "Because the reintroduction was experimental and because high mortality rates of black-footed ferrets born in the wild Meeteetse population indicated that survival rates of reintroduced black-footed ferrets would be low, it was important that animals chosen for reintroduction would not jeopardize the genetic goals of the captive program." (p. 264, Russell *et al.* 1994)

> "Survival for 30 days by at least 25% of the reintroduced animals is very encouraging. Natural mortality during the first year in the wild is high." (p. 265, Russell *et al.* 1994)

Other excerpts pertaining to the difficulty of re-introducing the black-footed ferret are provided here:

> "Only 8 of the 18 original animals [black-footed ferrets] captured at Meeteetse for the captive breeding program were believed unrelated enough to be considered genetic founders. Abnormal physical features (including webbed feet, kinked tails, short tails, oddly formed teeth, and internal hemorrhaging in kits) have been seen in some captive-born animals. Characteristics that favor survival and reproduction in captive animals may be different from those contributing to fitness of free-ranging ferrets. Captivity can affect animals in other ways, too. The unnatural cage environment may not help develop critical behavioral skills, a problem currently receiving research attention. Behavior is determined by environmental and genetic influences, but behaviors can be altered if a critical influence is absent or distorted." (p. 13, Godbey and Biggins 1994).

> "There is another potential time bomb ticking away, and that is the effects of being reared in artificial surroundings. Even with the carful hands-off policy practiced at Sybile, life in small cages of wire and wood painted government green is a far cry from life in a prairie dog community. The longer the black-footed ferrets remain thus confined, the more they risk becoming like the Siberian surrogates whose original traits already have begun to fade during their long sojourn in tame environments. Each new generation is a step farther along the road toward domestication, a process generally marked by a decrease in brain size as well as by the disappearance of key survival instincts...Yet the challenge of escaping predators is serious. Of the dozens of radio-collared Siberians released into the wild, a third sooner or later ended up in the jaws of badgers...Night-hunting raptors such as great horned owls snatched a couple as well. Obviously, any dulling of the black-footed ferrets' natural instincts will undercut their chances of success during reintroduction. Put another way, continuing to hold them in a safe place creates a growing danger of its own." (p. 16, Chadwick 1991).

It is not clear from the literature whether the comparison of the pet ferret to black-footed ferret survivability in the wild is completely valid.

8.2.4. Diet and Hunting Ability

The diet of *Mustela putorius sensu lato* described in the published literature varies from strictly carnivorous to omnivorous. Several authors state that the diet is strictly, or obligatorily, carnivorous ("hypercarnivore"), such as the following excerpts:

> "Completely carnivorous, taking a wide variety of prey as available. In Britain this includes the brown hare, rabbit, voles, mice and hedgehog; birds; common frog and lizard; and a variety of invertebrates including insect larvae and earthworms. The most frequently found were mammals and frogs. Presence of blowfly eggs and larvae suggest that some food is taken as carrion. Mammal prey is often in the form of several young animals, presumably from a nest." (p. 349-350, Corbet and Southern 1977).

> "They [Mustelinae] are more strictly carnivorous that the other groups and are efficient predators on small animals." (p. 12) (Anderson 1989).

> "Ferrets are known as 'obligate carnivores,' attesting to their dietary requirements for protein of high quality and quantity." (p. 38, Ball 2002)

> "It is not generally known that the ferret's choice of food is horse flesh. That must be an acquired taste, for, of course, the ferret could never secure such food." (p. 32, Harding 1915)

Cannibalism of their own young is noted in the some literature on polecats and ferrets; some excerpts are provided here:

> "When in young the jills require blood, and unless this is given to them, they will most probably eat their offspring. To illustrate the ferocity of these little animals and their thirst for blood when in this state, an instance may be quoted in which it is on record that they were known to have attacked a baby that by some means or other had been carelessly left unattended in a place to which they had access." (p. 53, Everitt 1897)

> "Before you decided to breed, ask yourself how you would feel about the following, because breeders face these situations at one time or another...Moms [i.e. jills] cannibalizing or killing the kits." (p. 333, Schilling 2007).

Some sources describe the diet as mostly carnivorous, such as the following excerpt:

> "Polecats are almost completely carnivorous, taking a wide variety of prey as available (Matthews, 1982). In Britain, this catholic diet includes shrews, voles, mice, rats, rabbit, hare, hedgehog (Lawrence & Brown, 1973); small birds, poultry, young game birds, eggs (Gouldsbury, 1977); frog, toad, lizards, snakes (Burton, 1976); and a variety of invertebrates, including beetles, bees, moth and fly larvae, spiders, slugs, snails and earthworms (Walton, 1970)." (p. 171, Blandford 1987).

Alterio and Moller (1997) described a varied diet of feral ferrets in New Zealand by examining gut contents; Roser and Lavers (1976) also discuss the ferret's diet. Most published sources report that the primary prey items are rodents and rabbits (e.g., Anderson 1989; Alterio and Moller 1997; Clapperton 2001); the ferret's predilection for rabbits is one of the primary reasons for its introduction into novel habitats where rabbit population control was desired. For example:

> "Diet studies have shown that young lagomorphs (rabbits and hares; *Lepus europaeus*) are the most important prey species for ferrets in many New Zealand habitats." (p. 363, Smith *et al.* 1995).

However, there are several published sources that describe the ferret and/or polecat to also have a predilection for milk (e.g. Everitt 1897). Fennell (1843) and Harding (1915) describe the ideal diet of ferrets kept in captivity as consisting of bread and milk. Likewise, Mannix (1967) describes a ferret breeding operation that used a similar diet:

> "The ferrets got very little meat. 'It seems strange that such a little killer as a ferret can be raised on wheat mash and milk, but apparently the milk takes the place of blood for them,' Dick explained. 'We tried giving them skimmed milk, but they have to have lots of cream. Ratcatchers who have only a few ferrets raise them on wholewheat bread with milk and a little raw hamburger." (p. 93, Mannix 1967)

Carnegie (1988) explained that this popular 19th century diet of milk and bread was misguided and detrimental to ferrets. This presumed predilection for milk has been used to explain accounts of ferrets attacking nursing human infants (see

review by Constantine and Kizer 1988). Both ferrets and polecats have been described as "bloodthirsty" (e.g. Bell 1837; Bachrach 1930), and the older literature describes many accounts of ferrets or polecats drinking the blood of their prey preferentially over eating other tissues (e.g. Fennell 1843, Everitt 1897). However, other authors, such as Branford (1987), state that *M. putorius* does not drink blood.

Both ferrets and polecats are sometimes described as indiscriminate killers and able to attack prey larger than themselves:

> "The cream-coloured ferret is a domesticated descendant of either the Asiatic or European polecat, but can soon revert to its wild form...Like the others of their clan, they are expert killers and overcome prey animals far larger than themselves." (p. 110, Roots 1976)

> "...a highly specialized and ferocious family—the Mustelidae. They are formidable killers, known for their voracious appetites and vicious dispositions. Secretive and spry, relatively little known, they are the most widely distributed mammalian predators on the continent." (Haley 1975, p. 11.)

Besides discussing traditional commercial pet diets, *Ferrets for Dummies* suggests the "Evolutionary Diet":

> "The evolutionary diet is simple. Essentially, you feed your ferret what she evolved eating. The polecat's diet is varied and includes, among other things, small mammals (rabbits, mature mice, weanling and older rats, and chicks), insects, amphibians, eggs, carrion invertebrates, and fish, with perhaps a tiny amount of fresh fruit to 'season' the diet....Because the ferret can consume an evolutionary diet, grow, survive, and successfully reproduce, the diet actually meets AAFCO (Association of American Feed Control Officials) requirements, the same as commercial kibble." (p. 130, Schilling 2007)

> "Converting your ferret to the natural world. Ferrets, like their polecat cousins, are olfactory hunters, meaning that they follow their noses to the dinner table. Whatever a ferret has consistently eaten during the first six months of her life, she'll see as the preferred food in the future—called olfactory imprinting. Getting a ferret to betray her nose after chowing on kibble for so long can be challenging. However, it's well worth the effort if you're a true believer in the natural diet and want to broaden your ferret's culinary horizons. Of course, the conversion should occur when your fuzzy is as young as possible, but you can teach old ferrets new tricks." (p. 136, Schilling 2007)

> "When your ferret finally switches to a raw food or evolutionary diet, she'll be likely to try just about anything, which is important because you don't want to stick just one food item in this diet." (p. 137, Schilling 2007)

The popular literature is full of statements that ferrets have lost their instincts to hunt, and would not be able to survive long without human support. Encyclopedia Britannica (1995)'s entry on *Ferret* states, "Domesticated ferrets have become so dependent upon humans that they cannot survive without care and if lost often die within a few days." (vol. 4, p. 747). Other examples include the following:

> "Ferrets are among the top-three popular pets in the United States. They have been around for more than 3,000 years as a domestic pet and cannot live more than three days on their own because they cannot hunt and would starve. They must have human contact every day ...." Anonymous. 2008. Ferrets can learn not to nip. Orlando Sentinel. Orlando, Florida. November 25, 2008. Pg. A16.

> "Wildlife and agricultural officials counter that wild ferret populations would pose a potentially serious impact on native species and small livestock animals, such as chickens and rabbits. Not true, says Fara M. Shimbo of Boulder, Colorado, author of two books on ferrets and director of the Office of Information for the Ferret Unity and Registration Organization (FURO). Pet ferrets are totally dependent upon their owners and their kibble bowls, contends Shimbo. Lost ferrets will usually starve in a few days, she says, and will not adapt to the wild if they stray from their homes." (p. 6, Weisser 1991)

> "Ferrets used to be much better predatory animals than they are today. Because they are kept primarily as pets, responsible breeders have bred only very docile adults. Many ferrets have become so gentle that we hear more and more stories of ferrets being very casual about rodents. The owners of a pet store once told me that they had a mouse escape and hide out in the ferret cage. The pet male ferret yawned and finished his nap. The unfortunate

mouse then ventured into the next cave of ferrets and found a female who still had some hunting instincts left. We know of another family who has one of the male ferrets we bred. This ferret has been completely adopted by their parakeet. The parakeet regurgitates food for him and regularly enters the ferret's cage. The parakeet pecks the ferret and initiates chase games. This ferret clearly has little hunting instinct left." (Morton and Morton 1995)

These authors give no empirical evidence to support their opinions. However, there are some scientific studies that suggest that hunting and courting behavior must be learned. Some examples are presented here:

"The animals eaten by the Polecat reflect its method of hunting, which depends largely on its sense of smell (Walton, 1970; see also Apfelbach & Ebel, 1975; Apfelbach & Wester, 1977). According to Apfelbach (1973a,b, 1978), smell serves as a sign stimulus for prey selection but the prey smell has to be learned. A sensitive period is supposedly established for this learning at 2-3 months of age and this then fixes the Polecat's food preferences for life. This did not hold true for captive Polecats studied by the present author (Blandford, 1986). The composition of the diet evidently changes with habitat type (Baliarin et al. 1980) and the dynamics of small mammal populations (Novikov, 1962), although a lack of consistency between authors in methods of presenting data makes detailed comparisons difficult." (p. 171, Blandford 1987).

"Living mammalian prey is killed by a neck bite, which is instinctive but only partly developed in young animals and must be perfected by practice (Eibl-Eibesfeldt, 1955, 1956b, 1963; Leyhausen, 1965)." (p. 172, Blandford 1987).

"Inexperienced male Polecats are immediately interested in females on heat. They seize them and attempt to copulate, but generally fail, as they do not grasp the female in the nape as do the experienced ones. The orientation of the bite in the nape must be learned, usually in sibling play (Eibl Eibesfeldt, 1963)." (p. 173, Blandford 1987).

"In ferrets acoustical, optical and olfactory cues are important for hunting. In spite the fact that in this carnivore searching for prey can be elicited by odors alone, innate olfactory recognition of prey does not exist. The results suggest rather, that ferrets have to learn how their prey smells." (p. 294, Apfelbach 1978b)

8.2.5. Other Relevant Traits

Habitat requirements or preferences of feral ferrets are discussed in Clapperton (2001). Other traits relevant to this study are surmised in the following excerpts:

"As compared with the European polecat or F_1 hybrids, the ferret is less alert, unafraid of man, tolerant of drastic changes in environment and shows less neophobia." (p. 35, Poole 1972).

"At least 3 species, the European ferret (*Mustela putorius*), the mink (*Mustela vison*), and the sable (*Martes zibellina*), have been raised extensively in captivity. The ferret alone is gentle enough to qualify as a domestic animal and has been the subject of domestication in Europe for at least 2,000 years (Hammond and Chesterman 1972). The first ferrets were imported to the United States in 1875 (Ryland and Gorham 1978)." (Murphy 1989, p. 107).

"A screeching sound means fear and warning, and ferrets startled enough to screech may also express their anal glands, producing a very foul-smelling secretion. Removal of the scent glands prevents this, but will not eliminate the typical ferret odor, which is more distinct in sexually intact males and females. Neutering will reduce, but not totally eliminate, this species-typical musky odor." (p. 38, Ball 2002).

Gewalt (1959) claimed that polecats and ferrets had differing color vision abilities, and attributed those differences to the eyes—his subject ferrets, all albinos, had red eyes.

Ferrets are often described as being intolerant of cold, and some authors go so far as to suggest that their distribution is distinct from polecats, which can tolerate cold and hunt in the snow and are distributed closer to the North Pole (Bell

1837; Harding 1915). Various authors suggest that ferrets are intolerant of hot temperatures (e.g. Schilling 2007). Another excerpt is provided here:

> "Poor sweat gland development. Ferrets are prone to heat stroke above 35 C." (Lewington 1988, p.2)

Most of these accounts of ferret thermal requirements lack empirical evidence. The physiological requirements of ferrets may limit their ability to survive or establish breeding populations in those areas of California that experience prolonged freezing conditions or prolonged hot temperatures.

Ferrets are highly susceptible to canine distemper; the case fatality rate approaches 100%, according to Ryland and Bernard (1983). Another source states a similar statistic:

> "Canine distemper is the most serious disease in ferrets. Essentially 100% fatal, the morbillivirus that causes canine distemper results in an accelerated syndrome that closely mimics signs seen in canids and other susceptible species." (Williams 2010)

Many authors suggest that ferrets are poor climbers (Moors 1983; King 1990) or climb rarely (Corbet and Covenden 1980); a specific example is provided here:

> "They are strong swimmers and will readily cross waterways to access new habitat (Global Invasive Species Database 2006). They are poor climbers and are not arboreal (Long, 2003)." (p. 6, Markula *et al.* 2009)

Some popular pet books suggest that they are, at the least, good jumpers, if not climbers:

> "Carpet sharks [a nickname for ferrets] are notorious explorers and excavators...And they all put their leaping skills to the greatest challenge." (p. 89, Schilling 2007).

What appears to be true from the published literature is that ferrets tend to prefer prey on the ground, and do not prefer to climb trees to pursue prey.

Powell and Zielinski (1983) discuss competition and coexistence between mustelids. Polecats / ferrets are among the largest of species in the genus *Mustela* (Kowalski 1976).

Ferrets have some predators:

> "In the wild, ferrets and polecats are killed by birds of prey such as hawks and owls and large carnivorous mammals such as wolves, lynxes and foxes" (p. 6, Markula *et al.* 2009)

> "The Polecat's ferocity and ability to produce a powerful scent protect it from most of the larger predators (Poole, 1970). Polecats are sometimes killed by dogs and possibly also by foxes (Petzch, 1953), although if a Polecat is attacked it will seize the aggressor's nose with its fangs, and the Polecat is only likely to be killed if it is caught unawares or if there is more than one attacker (Poole, 1970). Buffon (1847) described dogs fleeing from Polecats. The Polecat's dense fur and loose skin make it almost impervious to bites. Golden Eagles, *Aquila chrysaetos* and large owls will occasionally attack Polecats (Brehm, 1915; Toschi, 1965; Fozzer, 1982); otherwise man is the chief predator." (p. 176, Blandford 1987).

Phillips and Shimbo (1990) and Schilling (2007) discuss the aspects of ferrets that make them desirable pets. Ferrets also have some undesirable qualities:

> "There are additional notable problems peculiar to ferret ownership. Ferrets have anal sacs and other cutaneous glands in the perianal skin that emit an obnoxious smelling substance, the production of which can be decreased but not entirely eliminated by 'descenting' surgery similar to that performed on skunks...surgical neutering is said by some persons to lessen the tendency to bite...Female ferrets are seasonally polyestrous...unless they are bred or neutered, half of females will die from hypoplastic anemia (Ryland et al., 1983). These things, combined with the relatively short life span of ferrets (usually about half that of dogs or cats) are further reasons why ferrets would appear to be less desirable pets than other common pet species." (p. 21, Constantine and Kizer 1988).

8.2.6. Summary and Opinion

Ferrets have some, but not all, of the life history traits of an ideal invader species. The literature is divided on the issue of whether domesticated ferrets can revert to a feral condition and survive in the wild. All of the ideal conditions for establishment of a feral ferret population have not yet been met in California: a moderate climate, a superabundance of preferred prey, a community devoid of competitors and predators, and repeated introductions of large founder populations. Predation and competition from California's wildlife may be important factors that limit the success of the establishment of a feral ferret population. Obviously, sterilized ferrets have no potential to establish breeding populations. Popular pet manuals indicate that the breeding of ferrets, and the ownership of hybrids, are desired by a portion of the pro-ferret community. With or without regulations, the State of California cannot completely prevent the importation of fertile ferrets, polecat-ferret hybrids, or polecats. Thus, some risk of fertile ferrets, hybrids, or polecats establishing feral breeding populations in California still remains; no author or scientist has been able to convincingly enumerate that risk.

8.3. ABILITY OF FERRETS TO ESCAPE CONFINEMENT

Ferrets have a natural tendency to explore, to escape confinement, and to cache objects of interest—hence their Latin name "furo" which translates to "thief" in Latin (L. *furis, fur*). Authors such as Lewington (1988) and Wellstead (1981) call ferrets "*animal Houdinis*" (*i.e.* escape artists). Pro-ferret authors often claim that ferrets can be easily contained indoors and will not escape. For example, *Ferrets for Dummies* states that, "*Ferrets are indoor pets and escape is unlikely.*" (p. 65, Schilling 2007). But in another section of this popular pet guide, Schilling (2007) contradicts herself, stating "*Ferrets are master escape artists. They'll try to stick their heads into or through any opening they can get their snouts into. They can and will push open doors with their heads.*" (p. 42, Schilling 2007).

Most authors, including many pro-ferret authors, suggest that it is difficult to confine ferrets or retrieve escapees. Some excerpts follow:

> "However, ferrets are very adepts at escaping cages and households (e.g., often through clothes dryer vents), and they can be difficult to find and recapture. Upon realization that one's pet ferret is missing, a major promoter of pet ferrets advises organizing a search of surrounding homes (Morton and Morton, 1985). Thus, if one owns a ferret, one can expect difficulties confining the animal and interaction of the animal with neighbors." (pp. 18-19, Constantine and Kizer 1988)
>
> "Since ferrets have an inquisitive nature, they try to break out. Escaped ferrets will kill other [lab] animals such as rabbits or guinea pigs" (p. 43, Scharmann and Wolff 1987).
>
> " 'If let loose outdoors, 90% [of ferrets] get lost,' says Dr. Willard B. Nelson, who runs the Exotic Pet and Bird Clinic in Kirkland, Wash. 'They search out doors, dryer vents and cracks in a house's frame and just go. Once outside they think "Oh wow! This is fun!" Then, when hungry, they can't find their way back home.' " (p. 59, Williams 1984)
>
> "Since ferrets have an inquisitive nature, they try to break out [of lab cages]. Escaped ferrets will kill other [lab] animals such as rabbits or guinea pigs" (p. 43, Scharmann and Wolff 1987).
>
> "Their inquisitive nature often leads them to explore new environments and encounter other animals with fervor. (Exceptional care should be taken by the owner and clinician, as this inquisitive behavior in the domestic ferret makes it a great escape artist.)" (p. 700, Boyce *et al.* 2001)
>
> "...throughout the centuries the number of ferrets that have escaped and returned to the wild must be enormous" (Matthews, 1968)
>
> "At first, your home is a scary yet stimulating jungle to a tiny ferret, and she'll be chomping at the bit to find or cause trouble. And believe me, if she's able to find or cause trouble, she certainly will. Carpet sharks [a nickname for ferrets] are notorious explorers and excavators." (p. 89, Schilling 2007)

"Ferrets are master escape artists. They'll try to stick their heads into or through any opening they can get their snouts into. They can and will push open doors with their heads." (p. 65, Schilling 2007).

"Fuzzies are explorers by nature and can cover a lot of ground in only a few seconds....Unfortunately, without the proper restraint, it won't take your fuzzy long to get beyond your safe reach and into trouble.....I prefer harnesses because ferrets need less time to adjust to these new articles of clothing, and they're much more secure and safe. As an extra precaution, you should consider fastening an identification tag to your fuzzy's harness in case he does escape." (p. 316, Schilling 2007)

"It is completely within the realm of possibility to find a stray ferret" (p. 23, Jeans 1994)

"In California, many stray ferrets are found every year. From 1989 to 1998, 47 stray ferrets from communities in the general Sacramento region of the State were transported to the Department of Fish and Game field station for temporary holding. This represents but a small fraction of what escapes in the State as a whole. Such rescued ferrets are held until transported by volunteers to states where ferrets are legal." (Jurek 2001)

"Ferrets love to explore. And more often than not, they can get into trouble...Do not assume that an opening is too small for your ferret to get into...For this reason, you must anticipate escapes and ferret-proof your home before letting your ferret out to play....Some danger areas are: holes wider than an inch in diameter." (p. 40, Jeans 1994)

"Today, ferrets are widely kept as 'working pets', animals being offered for sale in pet shops, from market stalls and from numerous 'back garden' breeders throughout Yorkshire. Escapees from captivity and from rabbit hunting forays are frequently reported, mainly from the rural fringes of urban and particularly coal mining areas..It is not known how long ferrets survive in the wild. Some are relocated in the same warrens several months after their escape, though animals lost in regularly worked warrens are probably claimed by other ferreters and do not get the opportunity to 'go wild'. It is strange, however, that there is so little evidence of the establishment of feral populations. In 1890, Graves listed ferrets as part of the Cleveland fauna, though this could merely refer to tame animals being kept in the area. Colin Simms (*pers comm* 1975) has located a viable population in North Yorkshire and in 1975 a white ferret was seen in North Nottinghamshire gravel pit carrying young in its mouth. Elsewhere, feral populations are known from the Isle of Man, Anglesey, Renfrewshire and a population was established on Mull up till at least 1951." (p. 12, Howes 1980).

In *A Practical Guide to Ferret Care*, Jeans (1994) suggests various elaborate methods for retrieving an escaped ferret, including organizing neighborhood search parties and to "*Go around your neighborhood calling your ferret's name and squeaking the loud squeaky toy every 15-30 minutes.*" (p. 84, Jeans 1994).

Several authors suggest that unwanted ferrets are released into the environment by irresponsible owners:

"Given the foregoing kinds of difficulties peculiar to ferret ownership, especially biting, many owners try to rid themselves of the animals by (1) returning them to pet shops or other source of acquisition, (2) selling or giving them away, (3) turning them loose, (4) turning them in to animal control authorities for destruction, often accompanied with requests for rabies tests, and (5) not endeavoring to recover escaped animals." (pp. 21-22, Constantine and Kizer 1988).

"Jean Roush of the United States Humane Society says owners' ignorance about ferrets is the chief cause behind widespread abandonment of the animals. 'People see ferrets in pet stores and think the animals are cute, but later find them destructive to furniture. Many people set their ferrets loose and humane societies are getting flooded with the unwanted animals." (p. 59, Williams 1984).

"Rescuing the wayward weasel: stray ferrets. Unfortunately, some people will find stray ferrets that are lost or have been abandoned by their previous caretakers." (p. 61, Schilling 2007).

"Not all releases into the wild are the result of accidental escapes. In 1998, animal-rights activists released 10 ferrets and 161 minks from a Wisconsin facility that provides vaccines for the fur industry. Also, pet ferrets are abandoned by some owners, just as some people abandon rabbits, cats, dogs, and other kinds of pets." (Jurek 2001)

Several pet manuals suggest that ferrets may be kept outside year-round:

"Your ferret's house can be a cage, an aquarium, or a small room in the house that has been 'ferret-proofed.' You can even let your ferret live outside year round, but if you want to do this, be sure to place the ferret outside for the first time during the summer. Then it will be able to adjust gradually to changes in temperature and cooler weather as winter approaches." (Morton and Morton 1995)

"The ferret-proof garden. A must for the ferret owner whether dealing with one or many ferrets. Ferrets can get into all sorts of small places and gaps so an asbestos fenced garden with a solid garden gate flush to the paving stone surround is required. Ferrets dig—but the normal asbestos fencing provided it is at least 2 feet in the ground will keep them in. Ferrets climb—so avoid planks, and other objects leaning against the fence at an angle. Ferrets can't climb straight up trees like a cat but they might get up a trellis. Ferrets jump—from a solid base, so make sure they can't get onto tops of shed and jump into the neighbour's pool. It is possible to let the ferret run 'wild' in the garden once the above criteria dealt with." (p. 4, Lewington 1988)

American Pet Products Association, Inc. (2010) lists various categories of where pet ferrets were obtained in 2008, including 2% "*caught outside*". The exact excerpt is provided here:

Where small animals were obtained—2008. Ferret: 0% "bred at home"; 0% "humane society"; 2% "caught outside"; 12% "friend/relative; 2% "Internet/online"; 4% "newspaper/classified ad"; 46% "pet store"; 27% "pet superstore"; 4% "previous owner/private"; 5% "other". (p. 396, American Pet Products Association 2010)

8.3.1. Summary and Opinion

The literature indicates that ferrets can and do escape confinement, and that accidental or intentional releases of ferrets into the environment do occur. It does not appear to be possible to completely eliminate the risk of ferrets escaping confinement in California.

8.4. REGIONAL CASE STUDIES OF FERAL FERRETS

The popular literature on ferrets often states that breeding populations of feral ferrets exist in North America, but rarely is any evidence given, and none of it appears to be empirical. For example, in a book about animal bites, Nagami (2004) states, "*Escaped European ferrets have established self-sustaining feral populations...*" (p. 222), but Nagami offers no specific cases or literature citations. Following is an anectodal account of feral ferrets in eastern USA:

"When European ferrets were originally imported into the United States, around 1875, their natural aptitude for ratting made them extremely popular. Many people raised ferrets in their back yards and professionals bred them in large numbers (in fact New London, Ohio, used to call itself 'Ferretville U.S.A.' because many thousands of these animals were once raised and sold there). But because ferrets are natural hunters and because they are hardy, they soon became a plague for poultry farmers who were appalled at the ease with which a ferret could learn to love chickens and a life in the woods. So regulations were passed in many states, and the widespread popularity of the species became relatively narrow." (p. 91, Dolensek and Burn 1976)

Other authors state that ferrets have not established feral populations in North America; such as this excerpt:

"The domesticated ferret, although introduced to North America by the early English settlers some 300 years ago, has not established feral colonies on this continent." (p.6, Fox 1988).

In Lever (1985)'s checklist of naturalized mammals of the world, no exotic mustelid is listed as having been naturalized in North America. However, the ferret is included among 28 species of exotic mammals listed in the North American mammal checklist of Jones *et al.* (1997):

"Based on information presented by Hoffmeister (1986) and Jones and Schmitt (1997), we have added *Mustela putorius*, European ferret, to the checklist." (p. 4, Jones *et al.* 1997)

There is a general data deficiency in North America on the persistence of feral, exotic mammals. Even in New Zealand, the statement was made: "*There have been no extensive surveys of ferret distribution in the last forty years*" (p. 185, Clapperton 2001)

Next is presented an analysis of case studies of exotic polecats and ferrets by region. Analysis of these case studies is important because both pro-ferret groups and CDFG have used these case studies as arguments for the inability or proclivity (respectively), of ferrets to revert to a feral condition and establish breeding populations. In a 1986 memo, Eldridge Hunt, CDFG Chief of Wildlife Division, cited many of the following case studies as proof that ferrets would establish feral populations and threaten California wildlife (Hunt 1986).

8.4.1. European Case Studies

The following excerpts discuss the distribution of (native) polecats in Europe, and issues of population decline and hybridization:

> "Most of Europe except for Iceland, Ireland and northern Scandinavia. In Britain the Polecat is now confined to Wales and the adjacent parts of England. It extends eastward only to the Urals." (p. 182, Corbet and Covenden 1980)

> "In the British Isles, the formerly widespread range of the Polecat is currently restricted to Wales and the adjacent English counties (Corbet, 1971; Arnold, 1978, 1984)(Fig. 2). Here the distribution is also increasing in area (Biological Records Centre, unpublished) but largely for reasons different from those suggested for Continental Europe, namely a relaxation of persecution by man (Walton, 1970)." (p. 158, Blandford 1987)

> "In Europe from the Atlantic coast to the Urals, north to south-east Norway, south Finland and Sweden, south to the Mediterranean and the Black Sea. Eastward it is replaced by the steppe-polecat, *M. eversmanni*, with considerable overlap in eastern Europe and European Russia. Despite the much repeated statements of Cabrera (1932), does not appear to occur in Africa (Owen 1964). Introduced to New Zealand. In Britain, widespread up to nineteenth century but gradually exterminated over most of country. Apparently never present in Ireland. Last records for Scotland in 1907 (Tetley 1939). Gone from north-west and south-west England by mid-1930's. Apparently always plentiful in mid-Wales and Herefordshire at least. Now present in all Welsh counties, except Anglesey, as well as Herefordshire, Gloucestershire and Shropshire as a result of expansion from mid-Wales in 1950's (Walton 1964, 1968b). Records from outside this area need checking carefully because of confusion with feral ferrets. Introductions and escapes from wildlife parks probable in future." (p. 347-348, Corbet and Southern 1977).

> "During the nineteenth century in England, two species of native mustelid—the polecat (*Mustela putorius*) and the pine marten (*Martes martes*)—became extinct, largely because of persecution by gamekeepers (Corbet 1974, Langley & Yalden 1977). In contrast, the stoat and the weasel (*Mustela erminea* and *M. nivalis*), which were killed in even greater numbers, are still common and widespread (Corbet & Southern 1977). We suggest that the theory of life-history tactics offers an explanation for this differential effect, and has implications for contemporary programmes for predator control and for the conservation of declining species in New Zealand." (p. 619, King and Moors 1979)

> "The spread of rabbits and brown rats during the nineteenth century (Corbet 1974) might be expected to have arrested the decline of polecats, but apparently it did not. Either the keepering pressure was great enough to overcome this potential advantage, or some other, unknown, factor was involved." (p. 621, King and Moors 1979)

> "In Europe, *Mustela putorius* occurs from the Atlantic coast in the west to the Urals in the east; north to south-east Norway, south Finland and Sweden; south to the Mediterranean and Black Sea, excluding the Adriatic coast of Yugoslavia and much of the Balkans (Brink, 1967; Corbet, 1978; see also Hagen, 1966; Kumerloeve, 1970; Smolik, 1974; Crucitti & Tringalli, 1984)(Fig. 1). Its range on the continent has extended towards the north, east and south during recent decades and may currently be increasing in area (Walton, 1970). However, densities are

often sparse (Burton, 1980, 1982) and the Polecat is under pressure from land-use changes over much of its range in Western Europe. It has been shown that the spread of the Polecat into Finland from 1880 to 1930 coincided with a long-term change in the climate, which gave rather warmer winters with less snowfall; the number of Polecats caught in Finland dropped to one-tenth of its previous value after the hard winters of 1939-1942 (Kalela, 1940, 1948, 1952; see also Samarasinghe, 1976). Novikov (1962) attributed the northward and eastward migration to the clearing of forests and the extension of agricultural areas; dense forest masses form the northern and eastern limits of the distribution (Heptner, 1964; see also Tatarinov, 1952, Danilov et al., 1973)."(p. 157, Blandford 1987).

"Stoats are now numerous in a wide variety of habitat, and are the commonest and most widely distributed of the introduced mustelids. With no native carnivores in New Zealand, the major control agents are feral cats and even the introduced ferrets. This poses a problem in the 400,000-acre sanctuary established for rare flightless notornis, for neither feral cats nor ferrets are welcome there. The cream-colored ferret is a domesticated descendent of either the Asiatic or European polecat, but can soon revert to its wild form. Established ferally in Europe, particularly in Sardinia and Sicily, it is also plentiful in New Zealand, where there are two types. Called fitches, they resemble either the wild polecat or the domestic ferret and their pelts were prominent for a while in the fur trade. Like the others of their clan, they are expert killers and overcome prey animals far larger than themselves." (Roots 1976, p. 110)

"In Britain, domestic ferrets were probably introduced for hunting rabbits (*Oryctolagus cuniculus*), possibly by the Normans, or as late as the fourteenth century (Thomson, 1951). Inevitably, some domestic ferrets escaped and may have hybridized with native polecats (*M. putorius*) which were widespread and common at the time. Polecats began to decline around 1850, becoming extinct throughout much of England and Scotland, and reaching a nadir in the years prior to World War I. Along with a number of other British carnivores which survived in relict populations (wildcats, *Felis silvestris*; pine martens, *Martes martes*; Langley and Yalden, 1977; Strachan et al., 1996; Messenger et al., 1997), the near extinction of the polecat was a direct result of persecution by game-keepers (Langley and Yalden, 1977)... The relaxation from persecution, the banning of the gin trap in the 1950s, and the post-myxomatosis increase in rabbit numbers has apparently allowed polecats to expand their range, continuing to the present day where polecats have been recovered as far east as Oxfordshire and Northamptonshire (Birks, 1993, 1995, 1997). In addition, polecats have been covertly re-introduced to parts of Scotland (e.g. Argyll), Cumbria, and southern England." (p. 156, Davison *et al.* 1999)

The following excerpts discuss the distribution of feral and domesticated ferret populations in Europe:

"Established feral populations resulting from escaped domestic ferrets are found in parts of Britain, especially on islands (Anglescey, Man, Lewis, Arran) and also on some Mediterranean islands (Sardinia, Sicily). They are not likely to persist as separate, recognizable forms where wild polecats occur....Domestic ferrets are widely kept, especially for the control of rabbits. Feral animals behave as polecats." (p. 183, Corbet and Covenden 1980)

"Since Ferrets are widely kept, escaped animals may be encountered almost everywhere (Wellstead, 1981), and make it difficult to detect well-established feral populations (Walton, 1977). There are many such populations on islands in the Mediterranean, e.g. Sardinia and Sicily (Brink, 1967). In Britain, feral Ferrets occur, or once occurred, in significant numbers on Mull (Tetley, 1945; Brodie, 1978), Lewis (Cuthbert, unpublished), Bute (Gibson, 1970a), Arran (Gibson, 1970b), and the Isle of Man (Walton, 1977), as well as in several places on the mainland (e.g. Howes, 1980). Ferrets may have been brought to Britain by the Romans but probably arrived later, either with the Normans or possibly as late as the 14th century (Thomson, 1951). Introduced 'ferrets' are now widespread in New Zealand (Wodzicki, 1950; Marshall, 1961, 1963; Fitzgerald, 1962)." (p. 157, Blandford 1987).

"Feral polecat-ferrets in the British Isles are the result either of escaped albino ferrets breeding with wild polecats, or are escaped dark or parti-coloured animals which man has produced deliberately by crossing the domestic albino ferret with the wild polecat." (Lever 1985, p.60)

"In Europe, wild populations exist on the Isle of Arran, Isle of Lewis, Isle of Man, Isle of Anglesey; Sardinia, Sicily (in Italy), as well as reported sightings from the Azores (Portugal), the Netherlands, Inner Hebrides, Orkney Isles, Outer Hebrides, Shetland Isles (United Kingdom) and parts of mainland United Kingdom. Some of these populations (e.g. Isle of Man) are thought to have established from escaped domestic ferrets (Varnham, 2005)." (p. 7, Markula *et al.* 2009)

"Just before Christmas there was a reliable sighting of a ferret on northern Chatham Island and another sighting was made a week later about 40 kilometres away. It is not known whether the sightings indicate that a single animal or two or more ferrets are loose on the island. Forest & Bird spokesman Mark Bellingham said if ferrets became established on Chatham Island, it would pose a high risk of extinction of a range of threatened species, including:

- Taiko, the world's rarest seabird. Only about 100 remain and there are only seven known breeding burrows, all on Chatham Island.
- Chatham Island oystercatcher, the world's rarest oystercatcher. The population totals about 300 – 85% of them on Chatham Island.
- Chatham Island pigeon, the world's rarest pigeon. The population has struggled back up to about 200, with 90% on Chatham Island.
- Canterbury buff weka, virtually extinct on the New Zealand mainland but surviving due to its introduction to the Chathams.

Mark Bellingham said the arrival of the deadly predator on Chatham Island was a crisis of international significance, and all efforts must be made to eliminate them. 'Ferrets are the most dangerous predators of our native birds and the consequences of this incursion could be catastrophic. There have never been ferrets or other mustelids on Chatham Island before and their arrival now is of serious concern.' The Department of Conservation is aware of the sightings, but attempts to locate the ferrets with tracker dogs or catch them with traps have been unsuccessful. Mark Bellingham said efforts must be made to track the source of the ferrets to determine whether there were one or more ferrets loose, and whether any were female. It is currently the ferret breeding season, and if they breed on the island, numbers could quickly increase. A dog handler should be on stand-by on the island to immediately respond to any further sightings, Mark Bellingham said. He said DOC's efforts to catch the ferrets were laudable, but responsibility for biosecurity lay with the Chatham Islands Council, which was not adequately funded to deal with serious biosecurity incursions."
(Anonymous. 2008. Ferrets sighted on the Chatham Islands could spell disaster for some of the world's rarest birds. WildlifeExtra.com. http://www.wildlifeextra.com/go/news/chatham-ferrets.html#cr)

"On the island of Mull off the west coast of Scotland, where the polecat has never been indigenous, ferrets and polecats were both kept in domestication in about 1933-4; they soon escaped and interbred freely in the wild, before long becoming pests throughout the island where they preyed on rabbits, ground-nesting wild birds and domestic poultry. The well-known Scottish naturalist and author, Seton Grodon, recalls that polecat-ferrets were set free on the island of Harris in the Outer Hebrides to control rabbits where, in Mr Gordon's opinion, they were responsible for exterminating the ptarmigan (Lagopus mutus) the Hill of Clisham—its last haunt in the Outer Hebrides. From Harris they spread to the northern part of the island (known as Lewis), where they are said to be especially common around Uig. There are also thriving populations on the Scottish islands of Arran and Bute, on the Isle of Mann in the Irish Sea and on the Isle of Anglesey off the coast of north Wales, as well as in Renfrewshire and parts of Yorkshire...Feral ferrets are established in the wild in many places in continental Europe, being especially common, accord to Roots (1976), in Sicily and Sardinia." (pp. 60-61, Lever 1985).

"Since ferrets are widely kept, escaped animals may be encountered anywhere and make it difficult to detect well established feral populations. However, these appear to exist on the Isle of Man, Anglesey, in Renfrew and in parts of Yorkshire. Such a colony once existed on the island of Mull (Tetley 1945) and animals may still be there although 1951 was the last year that one was recorded. Other Scottish islands, however, seem to have thriving colonies, including Lewis (Cuthbert, unpubl.), Arran (Gibson 1970b) and Bute (Gibson 1970a)." (p. 352-353, Walton 1977)

"The rate of range extension for M. putorius has been documented in Finland, where between 1880 and 1940 it spread from the Karelian Isthmus north to central Ostrobothnia and west to the Gulf of Bothnia at a rate of 7.5 km per year or 750 km per century (Kalela cited in Kurten 1957). A similar rate can be postulated for the spread of ferrets during the Pleistocene when conditions were favorable." (p. 18, Anderson 1989).

"Seabird species were abundantly present in Sao Miguel, Santa Maria, Terceira, Graciosa, Sao Jorge, Flores and Corvo at the time of colonisation, namely Manx Shearwater *Puffinus puffinus* and Bulwer's Petrel *Bulweria bulwerii*. According to these historical chronicles past threats include intensive human exploitation and habitat deterioration. The significant decline in the abundance of these species in the XVI century is mentioned and related to predation by ferrets *Mustela furo*....In the Azores, the past and present occurrence of predators such as *Rattus rattus*, *Rattus norvegicus*, *Felis catus*, *Mustela nivalis* and *Mustela furo* has had a profound impact in the populations of seabirds, depriving ground nesting birds of using otherwise suitable breeding sites." (p. 16, Pitta Groz *et al.* 2002)

"Distribution: Since ferrets are widely kept, escaped animals may be encountered anywhere and make it difficult to detect well established feral populations. However, these appear to exist on the Isle of Man, Anglesey, in Renfrew and parts of Yorkshire. Such a colony once existed on the island of Mull (Tetley 1945) and animals may still be there although 1951 was the last year that one was recorded. Other Scottish islands, however, seem to have thriving colonies, including Lewis (Cuthbert, unpubl.), Arran (Gibson 1970b), and Bute (Gibson 1970a). They are widespread in New Zealand." (p .352-353, Corbet and Southern 1977)

"In the Azores, populations of Bulwer's petrel (*Bulweria bulwerii*) and Manx shearwater (*Puffinus puffinus*) have been significantly reduced by ferrets. Currently, ongoing predation by introduced rats, ferrets, cat and dogs prevents the majority of seabird species from breeding on the main islands (Monteiro et al. 1996)." (p. 8, Markula *et al.* 2009)

The ferret is apparently mentioned by Strabo in 1st Century BCE as having been introduced into the Balearic Islands to counter a plague of rabbits (Thomson 1951).

The following is an account of a British attempt to introduce mustelids to another island:

"As early as 1654 black rats (*Rattus rattus*) were a serious pest on some of the French islands in the West Indies...In an attempt to combat these depredations Sir Charles Price, Bt, introduced some ferrets (*Mustela furo*) from England in about 1750 which were, however, apparently rendered ineffective by attacks from chigoes (*Tunga penetrans*), a form of burrowing flea also known as chiggers or jiggers. A year or so later Price apparently made a second attempt with some unknown species of mustelid from South America, which was called by the natives the 'Charley Price Rat', but this, too, was unsuccessful." (p. 676, Lever 1985).

8.4.1.1. Summary and Opinion

The European case studies are extremely complex because Europe is in the heart of the range of both the ferret and the polecat. Domesticated ferret populations appear to be among the mustelids successfully introduced onto various islands, primarily for rabbit control. The exact genetic makeup of these populations is not certain, and may vary by region. It is not clear whether the American domesticated pet ferret can be directly compared to these European populations, and whether they can be assigned the same risk of establishment and adverse impact upon the environment.

8.4.2. New Zealand Case Study

King (1984b) should be consulted for a thorough discussion of the natural history of New Zealand in relation to exotic predators. The following excerpt describes the early New Zealand landscape:

"New Zealand has a spectacular history of introductions of exotic vertebrates. Before human settlement there were only two indigenous land mammals, both bats, but successful colonizations have expanded the current list to 35 species (Gibb & Flux 1973). Similarly, the 149 species of indigenous breeding birds have been supplemented by the establishment of 33 introduced species (Williams 1973). Many other mammals and birds were released but failed to become established. The majority of introductions took place in the second half of the last century

(Thomson 1922, Wodzicki 1950), mostly because the early European colonists were keen to recreate the faunal atmosphere of their homelands....Three species of European rodent arrived by chance, and colonized New Zealand in several stages between about 1770 and 1890 (Atkinson 1973, Taylor 1975). In contrast, three mustelid carnivores were released intentionally in the 1880s in an unsuccessful attempt to control rabbits *Orcytolagus cuniculus*. Both rodents and mustelids spread rapidly once they arrived. Naturalists soon reported that these predators were killing both indigenous and introduced birds, and some people claimed them responsible for serious declines in the numbers and distributions of many native birds." (p. 137, Moors 1983)

Laycock (1966), citing the work of Dr. K. Wodzicki (Department of Scientific and Industrial Research), stated that as many as 207 vertebrates may have been introduced into New Zealand, and at least 91 have become established. According to King (1990), the first ferret introductions into New Zealand occurred in 1879, the ferret was well established by end of 19th century, the first control programs began in 1930, and now New Zealand has the world's largest population of feral ferrets.

Lever (1985) gives a detailed account of the introductions of weasels, stoats, and ferrets into New Zealand from the 1860's to the end of the 19th century to control rabbit populations. By the 1940s, all three mustelids were established and widespread, but not evenly; stoats were "especially widespread", weasels were "more locally distributed", and ferrets were "restricted" (Lever 1985). The exact quote from Lever (1985) is as follows:

"Ferrets seem to have always had a restricted range in New Zealand. Wodzicki reported them to be rare or absent in the North Auckland peninsula from Kaipara harbour northwards, in the eastern part of the Bay of Plenty, on the east coast generally and in Poverty Bay, in large areas of Taranaki, in west Nelson and along the whole of the western coast of South Island. Elsewhere they were locally distributed on both main islands, preferring dry bush, paddocks, dried-up riverbeds and open tussock land: being poor tree-climbers their range is apparently largely governed by the distribution of rabbits." (p. 62, Lever 1985).

Stoats are often considered better hunters, and more successful, in New Zealand (e.g. Jeffares 1986; Palmer 1898); Wodzicki (195) states that stoats are the most widely distributed of the mustelids found in New Zealand, and that ferrets were "restricted" in their distribution. King (1989) states:

"*Both survived and spread, and now, over a hundred years later, stoats are present in virtually all forested areas. Common weasels, originally imported in much greater numbers, are now among the rarest of all New Zealand's mammals.*" (p. 209, King 1989).

"Implications for predator control and conservation in New Zealand. The two species which most successfully resisted the attentions of the English gamekeepers have both been introduced here, and the stoat is now very common in all forests, including all National Parks. The Parks are among the most important reserves for the conservation of our remaining native birds, and the reduction (or, if possible, extermination) of stoats in them is considered a highly desirable aim by the National Parks Authority...First, it is clear that control of stoats or weasels by trapping is unlikely to be successful except locally and temporarily." (p. 621, King and Moors 1979)

The following excerpts discuss the establishment, and later attempts to control, polecats and ferrets in New Zealand:

"Most of the deliberate releases of these aggressive small mustelids, and the related polecat and domestic ferret, were as biological controls, mainly to combat rabbits, mice and rats. None accomplished even this primary task with success, and they destroyed far more than just vermin. The introduction of the weasel and ferret into New Zealand—and foxes, cats, dogs, and other carnivores into many countries—cannot under any circumstances be considered successful. They all failed to control the pest species and caused much heartache with their own depredations on native animals." (Roots 1976, p.108-109)

"Adult ferrets have few predators in New Zealand except man." (p. 328, King 1990)

"All three [stoats, weasels and ferrets] are members of the mammalian order Mustelidae, which also includes the badgers, otters and skunks. They were introduced into both New Zealand and Australia almost a century ago to control the rapidly spreading rabbits. The ferrets, domesticated and therefore ready breeders in captivity,

benefited from official breeding programmes. Set up in 1897 they aided their production, availability, acclimatization and spread....Their dubious benefits as pest controls, and their small value as fur bearers, were far outweighed by their predation of native animals." (Roots 1976, p. 109)

"The first attempt to control ferrets was by a system of bounties, administered by the acclimatization societies and encouraged by the export of dried pelts (Wodzicki, 1950). Feral ferrets would, in theory, be as vulnerable to trapping as the polecat in Britain, which was intensively trapped by gamekeepers, to the point of extinction in lowland England (King & Moors, 1979a); but conditions in New Zealand are too different (the country is far less accessible, and the number of trappers too few) to achieve the same effect on a very large scale. Local problem ferrets attacking the endangered black stilt (Himantopus novaezelandiae) in the Mackenzie Basin, and chicks of the royal albatross (*Diomedea epomophora*) at Tararoa Head, Ontago, have been trapped for years, but are always replaced from outside the trapped area (King & Moors, 1979a, Pierce, 1982). The combined effects of predator-exclosure fences and intensive local and seasonal trapping have improved black stilt nesting success (Pierce, 1982), but many nests are still exposed to predation. The use of specific scent lures may increase the effectiveness and efficiency of trapping for ferrets (Clapperton, 1985; Clapperton, Minot & Crump, 1989), but other predators (cats, Norway rats) remain. Elsewhere, the ferret apparently presents little threat to New Zealand wildlife." (p. 329, King 1990)

"The Polecat was introduced to New Zealand during the 19th century, together with the Ferret, in an attempt to control rabbits. The first animals arrived before 1870, and many thousands were shipped over from London and set loose between 1882 and 1884. Although referred to as Ferrets, it is unlikely that all were domesticated, and some wild individuals from the continent were probably included (McCann, 1956). With little competition from native animals, the introduced mustelids spread and established themselves as permanent members of the fauna (Walton, 1977), and a definite New Zealand type now exists (McCann, 1956)." (p. 158, Blandford 1987)

Clapperton (2001) reviews the methods and efficacy of ferret control in New Zealand. Ironically, one of the most effective means of controlling ferret populations is to reduce rabbit populations (Clapperton 2001). According to King (1990) and other authors, ferret populations were regulated by prey abundance, primarily rabbits:

"Ferrets are generally much less abundant now than in the era (1880 – 1950) of massive rabbit numbers throughout the country (Marshall, 1963)." (p. 328, King 1990)

"New Zealand has the largest known population of feral ferrets, so conditions here must suit them well. During the era of greatest abundance of rabbits, where food was virtually unlimited, the breeding and survival rates of wild ferrets were probably much higher than recorded now, since about 1950 the numbers, and presumably also the reproductive and mortality patterns (though not, apparently, the general distribution) of feral ferrets have adjusted to a lower food supply. The earliest releases included many individuals with unnatural coat colours bred up by artificial selection during domestication, but most of these have reverted to the wild-type coloration similar to the polecats." (p. 328, King 1990)

Dowding and Murphy (2001) reviewed the status of New Zealand's endemic shorebirds and impacts upon them, especially exotic mammal predation. Mustelids are implicated in the decline of several bird species, but the majority of case studies and examples involve rats or cats, or habitat loss or other anthropogenic agents such as rabbit control. Dowding and Murphy (2001) theorize that because shorebirds, and ground-nesting birds in general, in New Zealand evolved without mammal predators, they are particularly vulnerable to mammal predation. According to Dowding and Murphy (2001), cats, ferrets, and stoats are predicted to be the greatest future threat to remaining endemic shorebirds in New Zealand.

There is no doubt that non-native mammals have severely impacted the native fauna of New Zealand. That portion of the impact attributable to polecats and ferrets is not as clear. Some excerpts explain the situation:

"The impact of feral ferrets on the New Zealand environment is difficult to assess. They failed to deal with the rabbit problem, since in the country generally the numbers and distribution of rabbits controlled those of the ferrets, not vice versa (Marshall, 1963; King, 1984a). However, where conditions favour the predators at the

expense of the prey, e.g., in a fenced enclosure, predation by ferrets and cats can be responsible for a huge reduction in rabbits...These ferrets may, at times, survive largely on other prey, but whether they have any effect on native fauna (e.g., birds) is unknown (Fitzgerald et al. 1984)." (pp. 328-239, King 1990)

"The suspicion that ferrets were having an adverse effect on our native fauna has now been confirmed for a number of species." (p. 195, Clapperton 2001)

"The Polecat was introduced to New Zealand during the 19th century, together with the Ferret, in an attempt of control rabbits. The first animals arrived before 1870, and many thousands were shipped over from London and set loose between 1882 and 1884. Although referred to as Ferrets, it is unlikely that all were domesticated, and some wild individuals from the continent were probably included (McCann, 1956). With little competition from native animals, the introduced mustelids spread and established themselves as permanent members of the fauna (Walton, 1977), and a definite New Zealand type now exists (McCann, 1956)." (p. 158, Blandford 1987)

"It is possible that the original introductions included genuine wild polecats (*M. p. putorius*) as well as ferrets." (p. 323, King 1990)

"Predation by feral cats *Felis catus*, stoats *Mustela erminea* and ferrets *Mustela furo* is the principal cause of Yellow-eyed penguin *Megadyptes antipodes* (hoiho) chick mortality on South Island, New Zealand." (p 187, Alterio *et al.* 1997)

"In New Zealand, ferrets are a potential conservation threat, as they prey on many endangered or threatened endemic wildlife species, including black stilts (*Himantopus novaezealandiae*) (Pierce 1982), banded dotterels (*Charadrius bicinctus*) (Rebergen 1993), yellow-eyed penguins (*Megadyptes antipodes*) (Ratz et al. 1992), and royal albatrosses (*Diomedea epomophora*) (Lavers & Clapperton 1990). Recently, there has been concern over the role that ferrets may play in spreading *Mycobacterium bovis* (bovine Tb) to cattle and deer." (p. 363, Smith *et al.* 1995)

"New Zealand's alien mustelids failed to achieve more than a limited control over the country's introduced rabbit population; instead, they found the native birds to be much easier prey, since they were not pre-adapted to avoid predators as were the rabbits and other—all introduced—mammalian species..." (p 62, Lever 1985).

"Stoats are not the only introduced predators in New Zealand, and in certain habitats are not the most important. On pastoral land another mustelid, the feral ferret (*Mustela putorius furo*), is more common, and on offshore islands the worst pests are undoubtedly rats. The ferret is a domesticated strain of the polecat, and the two forms may well have similar life-history tactics. There are few data on the trapping of ferrets other than the figures given by Wodzicki (1950) for sales of ferret pelts bought from rabbit trappers during the 1940s. There is no way of estimating the ecological effect of this harvest, which has anyway greatly decreased since the regional Rabbit Boards have managed to control most rabbit populations. However, ferrets remain locally common and a potential nuisance, for instance at the albatross breeding colony at Taiaroa Head, near Dunedin. The decline in Britain of polecats, at least partly as a result of keepering, suggests that ferrets might be easier than stoats to control by trapping. However, the surest way to reduce the numbers of ferrets is to control their staple food, rabbits (Gibb & Flux 1973)." (p. 622, King and Moors 1979)

"General Impact. In their introduced range, ferrets (Mustela furo) threaten a variety of native wildlife, for example, ground nesting and flightless birds in New Zealand (DOC 2005; Norbury 2001; Clapperton 2001). They have also contributed to the decline of seabird populations on the Azores (Pitta Groz et al. 2002), and reduced bird populations in the Scottish isles (Lever 1985; Corbett and Southern 1977). Ferrets are also a known vector for bovine tuberculosis (Mycobacterium bovis), which is present in reservoir populations in the introduced brushtail possum (Trichosurus vulpecula) in New Zealand (de Lisle et al. 2002). Bovine tuberculosis can be transmitted by direct contact or via contamination of pasture and food (Ragg 1998). In Europe ferrets are sympatric with wild polecats and there is a danger of hybridisation (Davison et al. 1999)." (USGS 2008)

"The actual impact of these predators [weasel, stoat, ferret, cat] is difficult to assess. It is relatively simple to identify the foods that are taken, but much more difficult to tell if this predation is affecting the population of the prey species." (p. 12, Fitzgerald *et al.* 1984)

"Study the following four statements and decide, before reading further, whether or not you agree with each. (1) The native animals and birds of New Zealand evolved in a land free of all predators; they adapted to life on the ground because they never needed to fear meeting a hungry hunter. (2) The main reason for the decimation of our native species in the last thousand years is that they were incapable of defending themselves from various exotic predatory animals which accompanied the human colonists—both Polynesian and European—to New Zealand. (3) Introduced predators are now widespread on the mainland; they still kill and eat native animals and birds, and must affect their numbers; so they should all be controlled, especially in major wildlife sanctuaries such as the National Parks. (4) Of all the predatory animals brought here, by far the worst are the mustelids (a collective term for stoats, weasels and ferrets), and if it were possible, these should be not merely controlled, but exterminated on all protected lands. If you agree strongly with all four statements, you are in good company, since most other conservationists would too; but would be wrong. There are good reasons for giving only qualified assent to the first and second propositions, and the third and fourth reflect opinions which are very widely and ardently held among birdwatchers, but which are largely untrue." (p. 11, King 1984)

"So, surprising as it may seem, mustelids cannot be proved to be directly responsible for any of the shockingly long list of island populations of birds that we know to have become extinct since the human colonisation of New Zealand, and they can be suspected of finishing off only a handful of South Island species and, perhaps, the huia. By contrast, the record of cats is very black, and of man and rats worse still. This is not to say that the mustelids were not capable of inflicting as much damage, or more: it simply that they did not have the opportunity. The worst damage is always done by the first predators to arrive, which were usually men in boats (canoes or sailing ships) and the animals that they carried with them." (p. 14, King 1984)

In his study on the impact of predation upon birds (native and naturalized), Moors 1983 made the following observations and conclusions:

"Mustelid predation at Kowhai Bush were probably all the work of stoats and weasels. Ferrets *Mustela furo* also inhabit the Bush, but they climb only rarely (Corbet & Southern 1977). Weasels are much less common than stoats in New Zealand (Marshall 1963) and very few were observed or trapped at Kowhai Bush. Stoats were sighted regularly but their numbers could not be estimated....Nevertheless, these few mustelids were able to inflict heavy losses on eggs and nestlings, probably because they became experienced and specialized predators of such prey (Ewer 1973). Elsewhere in New Zealand avian prey are also an important component of the spring diet of stoats and weasels. For example, remains of birds and eggs were found in the guts of 41.4% of 169 stoats collected in spring from forests (King & Moody 1982)." (p. 150, Moors 1983)

"Since European settlement the endemic land birds have undergone a dramatic decline in numbers, diversity and distribution...The three main reasons put forward to account for this dismal record are the modification of vast areas of habitat, especially forests, the arrival of mammalian predators and the introduction of new diseases. Since the early 1800s roughly two-thirds of New Zealand's native forests (which originally covered about 66% of the country) have been destroyed (Mills & Williams 1978)...Clear-felling reached a peak of activity during the final quarter of the last century, coinciding then with the establishment of new and skilful predators [namely ship rats (Atkinson 1973) and mustelids (Wodzicki 1950)], the introduction of alien birds (Thompson 1922), and the possible presence of novel avian diseases (Myers 1923). These decades also coincide with major declines in many of the endemic birds (Mills & Williams 1978). For most species it is now virtually impossible to identify the precise parts played in these declines by loss of habitat, predators and disease because, except for a few species, the relevant contemporary data are lacking. In any case, the impact of these three factors probably varied from one species to another. The destruction of habitat and its modification by introduces browsing mammals must, however, have had a serious effect, if only because they forced a reduction in the abundance and distribution of

the birds; and they may also have made the populations more susceptible to other influences, such as competition from introduced birds (see Diamond & Veitch 1981)." (p. 151, Moors, 1983)

"At present the bulk of the case against introduced predators rests on circumstantial and inferential evidence. It is not sufficient to show merely that predators kill many birds or plunder many nests—the crucial point is whether losses from predation cause annual mortality to exceed annual recruitment. Only when this happens can predators correctly be blamed for causing a population decline....Although the circumstantial evidence is damning, this direct relationship between predation and decline (and ultimately extinction) has rarely been demonstrated in New Zealand....In any event, it is unlikely that introduced carnivores would have had the same blanket effect on all the native avifauna." (p. 152, Moors, 1983)

"The New Zealand region contains about 11% of the rare and endangered bird species listed in the IUCN Red Data Book (Mills & Williams 1978)....Introduced rodents, mustelids and cats have undoubtedly had a serious impact on the New Zealand avifauna. But it is not merely pedantic to question the role which this impact has played in causing extinctions, both historically and at the present time. Only if the effect of these predators on their avian prey is understood in some detail can we know if predator control is justified (either biologically or economically), whether predators threaten a particular species, and if they do, how best to protect it. Furthermore, unquestioning concentration on the current impact of predation may mean that other and perhaps more dangerous influences, such as habitat destruction, are put to one side." (p. 153, Moors, 1983)

Ironically, New Zealand has allowed the breeding of ferrets to stimulate its fur trade:

"The skins of ferrets have, in the past, been valuable in the fur trade. In 1948, at least 4904 superior and first class New Zealand fitch skins were offered for sale...However, skins collected from the wild are less reliable, in quality and supply, than those purpose-bred. Hence, fitch farming is a developing industry, and New Zealand is now one of the main world suppliers of fitch pelts...In 1985, 100,000 fitch skins were exported from New Zealand...In 1986, there were about 127 registered farms (R. Williams, unpubl.), the earliest were stocked with feral animals collected locally, but later ones imported superior stock from Scotland and Finland. Permission to import them depends on the argument that escapees would do no more than temporarily add to the existing population of feral ferrets, and hence the fitch fur industry has no actually or potentially deleterious environmental effects. This argument is accepted by MAF, despite occasional protests from conservationists. The number of ferrets imported was high at first, declining as the imported ferrets became self perpetuating: 2436 in 1982, 1195 in 1983, 1479 in 1984, 0 in 1985 (MAF, unpubl.). However, the importation of other carnivores (e.g., mink) is strictly prohibited; mink look similar to ferrets but have a very bad record of damage to the native biota in countries where they have escaped from fur farms. All ferrets imported into New Zealand are carefully checked to ensure there are no mink among them." (pp. 329-330, King 1990)

Jeffares (1980) also discusses the burgeoning the use of ferrets in fur production in New Zealand. Clapperton (2001) states:

"The recent spread of ferrets into some of these areas may have been aided by the establishment and subsequent failure of the fitch farming industry. During the 1980s there were 17 fitch farms in Northland, and now there are none (Northland Regional Council, unpubl. data). Many of the isolated ferret records from Northland have been from the vicinity of former fitch farms, and it is suspected that these animals escaped or were liberated (Pierce 1996)....There is also the concern that the pet trade may be widening the distribution of ferrets. For example, a neck-collared ferret was caught on Mauao (Mt Maunganui) in late 1999. It is believed that farmed ferrets were released near Matawai, in the East Cape district, in or around 1984, coinciding with a crash in the local weka (*Gallirallus australis greyi*) population." (pp. 186-187, Clapperton 2001).

In 2001, the Department of Conservation's Chief Technical Officer Geoff Hicks declared ferrets unwanted organisms under the Biosecurity Act. In 2002, the law was changed to ban the sale, distribution and breeding of ferrets; this did not apply to existing pets.

8.4.2.1. Summary and Opinion

The New Zealand case study is very complex. Domesticated ferrets appear to be among the mustelids intentionally and repeatedly introduced in the late 19th century for rabbit control; ferrets may also have also have been accidentally released from fur farms. Feral, breeding populations of *Mustela putorius sensu lato* have apparently existed in New Zealand for over a century; the exact genetic makeup of these animals is not certain, and may vary by region. It is not clear whether the American domesticated pet ferret can be directly compared to these New Zealand populations, and whether they can be assigned the same risk of establishment and adverse impact upon the environment.

8.4.3. Australia Case Study

Bomford and Hart (1998) report the following tally of introduced species in Australia:

> "...about 20 mammals, 30 birds, 20 freshwater fish, several amphibians, 500 invertebrates, and 1,500 plants—which are pests of agriculture and/or the environment." (p. 406, Bomford and Hart 1998)

Bomford and Hart (1998) go on to state:

> "There is a risk that new imported species, or exotic species that are currently kept in private collections and zoos, could escape and become pests...Ferrets have established wild populations in New Zealand and have had highly detrimental effects on wildlife. Yet ferrets can be kept without any permits or restrictions in Australia, and a wild population has now established in the Australian island state of Tasmania." (p. 406)

Australia has apparently not been impacted by polecats and ferrets as has New Zealand:

> "It is estimated that up to 150,000 domestic ferrets are kept as pets in Australia (Olsen & Jensz, 2005). There are ten ferret welfare societies and clubs in Australia (located in every state except the Northern Territory) (Oz Ferret, 2008). Small numbers of wild (feral) ferrets have been seen at South Arm, Tasmania, where efforts to detect a naturalised population have so far failed (M. Statham pers. comm., DPIW TAS, 2006). Small numbers have also been seen in the southwest of Western Australia (Western Australian Museum, 2003). However, a wild population has not been confirmed. There is anecdotal evidence that a small population of feral ferrets has managed to persist for many years in a small area of forest near Inglewood (southern Queensland) (J. Mitchell, pers. comm.). This population may have existed since the first rabbit plagues, when professional rabbit hunters used ferrets to hunt rabbits. Occasional sightings of lone ferrets have also been reported from various parts of north Queensland, such as near Townsville and Cairns (J. Mitchell pers. comm., R. Hynes, pers. comm.). However, these could be escaped pets and a naturalised population has never been confirmed... Ferrets have naturalised in New Zealand (both North and South Islands)..." (p. 7, Markula *et al.* 2009)
>
> "If ferrets ever naturalise to fill their full potential range in Queensland, their primary impact is likely to be as a new predator of small to mid-sized native animals, such as possums, bandicoots, birds, bird eggs, lizards, frogs, fish and invertebrates. As has occurred in New Zealand, ground-dwelling or ground-nesting birds are particularly at risk." (p. 9, Markula *et al.* 2009)

Forsythe *et al.* (2003) developed a computer model to analyze the success or failure of vertebrate introductions into Australia. They determined that for both mammals and birds, species were more likely to successfully establish where they had wide climate tolerance or that the climate of their native range matched that of Australia, where they had been successfully introduced elsewhere, where more effort had been put into their introduction, and where the body size was small and reproduction rates fast. They concluded:

> "Although the above factors have useful explanatory value, the outcome of any one introduction can remain difficult to explain. For example, the polecat-ferret (*Mustela putorius furo*) has a close climate match with Australia. Despite this, and the fact that it must have been deliberately and inadvertently introduced many times, this species has failed to become established. Releases of the species in Australia have mostly involved animals from the domestic end of the pole-cat spectrum, and it may be that domesticated forms are less likely to establish wild populations than undomesticated polecats. Releases in New Zealand, where the species has established a wild population, included polecats (Blandford 1987). Alternatively, factors unrelated to introduction effort and climatic suitability may be important. One possibility is that ferrets exhibit inappropriate antipredator behavior

towards foxes and are quickly preyed upon (Georges 2000). The ferret has established widespread populations in New Zealand, where there are no larger predators." (p. 566, Forsyth *et al.* 2003)

8.4.3.1. Summary and Opinion

Instances of stray or feral ferrets have apparently occurred in Australia, but there is little evidence of the establishment of any feral breeding population. The reference to a breeding population in Tasmania could be investigated further. Some scientists express a concern over the possible establishment of mustelids in Australia. Nationally, Australia apparently does not ban the importation or possession of pet ferrets.

8.4.4. Arizona Case Study

Ferrets are listed in the *Introduced, Nonnative Mammals* section in the Arizona state checklist by Hoffmeister (1986):

"*Mustela putorius* Linnaeus—European Ferret
European ferrets, sometimes referred to under the name *Mustela furo*, are frequently sold as 'pets' in some stores. However, Pat O'Brien informs me (letter of 1984) that they occur in the wild in various places in Cochise County. On May 8, 1972, a ferret was seen near a farm pond in the Kansas Settlement area east of Willcox Playa. Again on June 16, 1975, one was sighted within a few miles of the earlier observation. On February 19, 1984, one was retrieved at the city limits of Sierra Vista. This is nearly 50 airline miles from earlier sightings. The presence of this ferret in a wild condition in Arizona should be of grave concern to ecologists and conservationists." (p. 559, Hoffmeister 1986)

On the Jurek and Ryan (1999) questionnaire, agency personnel from the Arizona Game and Fish Department Non-game Division answered as follows:

Do you have evidence of the following?
Cases of stray individuals in urban areas: Sporadic.
Free-living individuals documented as surviving more than a few days in wild: No.
Breeding suspected in the wild now: [blank] or in the past: No.
Breeding individuals documented in the wild now: No or in the past: No
An established breeding population of domestic ferrets in your state: "has been reported, but not confirmed as existing"

Environmental Concerns: Arizona recently initiated a reintroduction program for black-footed ferrets (Mustela nigripes, BFF). The establishment or release of pet ferrets with the expected range of BFFs is a concern."

In the CSUS questionnaire, Diane Eckles (Chief, Office of Environmental Health, Arizona Department of Health Services) answered "Don't know" to questions regarding the existence of abandoned ferrets, feral populations, or the harassment of livestock or wildlife. Holly Hicks (Small Mammal Biologist, Arizona Game and Fish Department), answered "*Don't know*" to questions regarding the harassment of livestock or wildlife, answered "*Don't know exactly, but my professional estimate is 10 to 100 ferrets*" to the question of abandoned or stray ferrets in Arizona, and answered "*No, or probably not*" to the question of established feral populations in Arizona.

8.4.4.1. Summary and Opinion

Instances of stray or feral ferrets have occurred in Arizona, but there is no evidence of the establishment of any feral breeding population. Arizona agency personnel have previously expressed concern over the possible establishment of ferrets in their State, but this concern was not expressed concern in the CSUS questionnaire.

8.4.5. New Mexico Case Study

A 1984 memorandum from the New Mexico Department of Game and Fish documented a man that released 3 ferrets into the wild in an attempt to control prairie dogs on his property. In 1987, the Village of Corrales Animal Control Department live-trapped 1 of 2 ferrets that had entered a residence; in that same year, pet dogs killed a ferret in a backyard. There were anectodal accounts of feral ferrets in New Mexico, such as the following:

"There are some serious threats of the spread of other exotic species in the United States in general and in New Mexico in particular. For example, *Mustela putorius* (European ferret) has been documented to occur in the wild now in Arizona (Hoffmeister 1986), some of these mammals have been killed by hunters in Mississippi (Cheri A. Jones, pers. comm.), and there are reports of this species that may represent established populations in New Mexico (NMDGF, unpubl. data)." (p. 201, Jones and Schmitt 1997)

"New Mexico: Feral ferrets were reported in the 1980s in several locations in New Mexico, mainly the result of legal, purposeful releases of ferrets in prairie dog towns as a biological control method. The following letters dated October 7, 1987, October 27, 1987, November 6, 1987, and August 2, 1989, were provided by New Mexico Department of Game and Fish to representatives of two ferret organizations in reply to survey letters requesting or clarifying information on the occurrence of feral ferrets in New Mexico. None of these reply letters was included in the California Domestic Ferret Association report. Instead, a copy of a California Domestic Ferret Association survey letter of August 11, 1989 to New Mexico Department of Agriculture, with a reply marked on it, was included as that state's response. As in the Alaska instance, this letter was tallied in that report as being one of the 46 replies from 'State Departments of Fish and Game (or equivalent)'." (Jurek 2001).

In a letter to W. Phillips (California Domestic Ferret Association), Harold Olson (Director, New Mexico Department of Game and Fish) stated:

"...With regard to your question concerning the possible existence of feral populations of the species in the state, the answer is affirmative. Based on our most recent information, small populations of feral ferrets occurred as recently as the early 1980's in the Clovis, Roswell, and possibly Farmington areas. These ferrets were typically in or near areas having colonies of black-tailed prairie dogs (*Cynomys ludovicianus*). We have no information on the numbers of ferrets in those areas or whether the animals persist at present....In closing, let me assure you that European ferrets are a concern of ours in New Mexico—especially in regard to negative impacts that they might have on native wildlife. For example, their occurrences in prairie dog towns could well pose a threat to the black-footed ferret (*M. nigripes*), including in competition for prey. In addition, European ferrets are capable of competing with other species including native carnivores such as weasels and foxes. European ferrets also have the potential for causing harm by preying on native wildlife and domestic animals. In fact, we know of ferrets having been killed while attempting to kill domestic chickens in the Santa Rosa area. Finally, European ferrets may transmit diseases to native wildlife, including rabies and distemper. If the species were not already established in the commercial trade and as pets in New Mexico, there would be every reason to ban their importation, sale, and possession in the state."

A letter was written to Phillips by John Hubbard (Assistant Chief for Endangered Species, New Mexico Department of Game and Fish) on October 27, 1987, who stated:

"In essence, if we did not already have ferrets in the state, we would probably endeavor to keep them from being kept here as pets. However, this is a moot point, as the animal is already here and is likely to stay. Finally, I hope that you can sympathize with the California Department of Game and Fish [sic] in its efforts to conserve the considerable biological diversity that historically occurred in your state. Not only have millions of people swarmed over the areas occupied by that area's wildlife, but many other problems have arisen. One of these has been the introduction of exotic wildlife, including both invertebrate and vertebrate animals. One cannot blame the department for wanting to remove additional risks to native wildlife by banning as many exotics as possible, including the domestic ferret."

A second letter was written to Phillips by John Hubbard (Assistant Chief for Endangered Species, New Mexico Department of Game and Fish) on November 6, 1987:

"I am sorry that confusion has arisen over information that I supplied in my letter to you of October 27, 1987. Actually, there is no contradiction in the items that you cite in your letter. The answer is indeed affirmative that we have had reports of ferrets living ferally in New Mexico, these sites having been identified for you in the copy of our letter to Mr. Phillips. As for domestic ferrets having negative impacts on native wildlife in New Mexico, I said <u>possibly</u> because we have no actual proof of this. In other words, we do not automatically assume such impacts occur—even though we have had reports of ferrets living ferally in New Mexico. As for the basis for our

information on feral ferrets in the state, this is in the form of reports received from various people from the late 1970's to the present time. However, we do not keep an exhaustive file on the subject, given the many other tasks to which we must attend."

On the Jurek and Ryan (1999) questionnaire, New Mexico agency personnel answered as follows:

Do you have evidence of the following?

Cases of stray individuals in urban areas: Common.
Free-living individuals documented as surviving more than a few days in wild: No.
Breeding suspected in the wild now: No or in the past: No.
Breeding individuals documented in the wild now: No or in the past: No

An established breeding population of domestic ferrets in your state: "would not likely exist"

Environmental concerns: "*Establishment of population is of concern to well-being of native species and prey bases.*"

In his response to our CSUS questionnaire, Dan Brooks (Chief, Law Enforcement Division, New Mexico Dept. of Game & Fish) estimated the total ferret population in New Mexico at 1,000 to 10,000, stated that he had no specific records of ferrets harassing wildlife, but estimated 1 to 100 instances per year; and he answered "*No/probably not*" to any instances of feral ferrets establishing breeding populations.

8.4.5.1. Summary and Opinion

Instances of stray or feral ferrets have occurred in New Mexico, but there is little evidence of the establishment of any feral breeding population. New Mexico agency personnel have previously expressed concern over the possible establishment of ferrets in their State, but this concern was not expressed concern in the CSUS questionnaire.

8.4.6. Nevada Case Study

Sue Coffey (Detective, Carson City Sheriff's Department) mentioned some instances of stray ferrets in Nevada:

"Ferret proponents will tell you that they cannot survive outside. This is absolutely untrue. They are alive and well in our counties, trash cans, parks, and woods. Unfortunately, because they smell and require a lot of attention, some owners have released their ferrets into the wild." (p. 17, Hitchcock 1995).

On the Jurek and Ryan (1999) questionnaire, agency personnel from the Nevada Division of Wildlife answered as follows:

Do you have evidence of the following?

Cases of stray individuals in urban areas: Rare.
Free-living individuals documented as surviving more than a few days in wild: No.
Breeding suspected in the wild now: No or in the past: No.
Breeding individuals documented in the wild now: No or in the past: No

An established breeding population of domestic ferrets in your state: "would not likely exist"

On the CSUS questionnaire, Nevada agency personnel estimated "*0 to 1 instances per year*" of wildlife and of livestock harassment; "*Don't know*" of abandoned or stray ferrets in the State, and "*No, or probably not*" for feral populations in the State.

8.4.6.1. Summary and Opinion

Instances of stray or feral ferrets may have occurred in Nevada, but there is no evidence of the establishment of any feral breeding population. Nevada agency personnel have previously expressed concern over the possible establishment of ferrets in their State, but this concern was not expressed concern in the CSUS questionnaire.

8.4.7. San Juan Islands (Washington) Case Study

In his thesis on the mammals of the San Juan Archipelago, Schoen (1969) does not list ferret or polecat (*Mustela putorius sensu lato*) in his list of native or introduced mammals. No ferrets or polecats were caught during his extensive trapping of small mammals. Previous checklists of the mammals of the San Juan Archipelago do not list ferret or polecat (*Mustela putorius sensu lato*) (reviewed by Schoen 1969). Two native mustelids occur on the San Juan Islands: mink (*Mustela vison*) and river otter (*Lutra canadensis*); there are also historic accounts of fisher (*Martes pennanti*). The following are excerpts from Schoen (1969) that may be relevant to this case study:

> "It is interesting that the red fox, Vulpes fulva, was introduced on San Juan in an attempt to reduce the rabbit population. Osburn (personal communication) stated that it was introduced as a pair in 1947 and others were brought in during the later 1940's. It has had little effect on the rabbit population but has caused other problems. The fox is now nearing extinction on San Juan Island." (p. 17, Schoen 1969)
>
> "Immigration of mink to the islands was probably similar to that of the raccoon though mink are better adapted for swimming. Colonization of islands is probably more dependent on a food source than on the animal's dispersal ability...The mink's predominate [sic] prey on San Juan Island may be the rabbit, Oryctolagus cuniculus, though this has not been quantitatively studied...Mink have few predators other than man and possibly the great horned owl. A few mink were trapped annually on the islands." (p. 45, Schoen 1969)
>
> "There are three possible reasons for the fact that many mammals inhabiting the mainland are not found in the islands; 1) The mammals did not successfully cross the water barrier; 2) They crossed the barrier but their habitat requirements were not fulfilled; or 3) They crossed the barrier but their ecological niche was alread filled by a similar species. According to Grant (1970) ecologically similar species have greater difficulty coexisting on islands than on the mainland." (p. 59, Schoen 1969)
>
> "The larger mammals Odocoileus, Lutra, Mustela vison, and Procyon are more widely distributed than Ondatra, Peromyscus, Microtus, and Sorex. Because of their ability to disperse easily, the larger mammals occupied or visited most islands of the archipelago. Whether they were resident or visitor to an island was related to that island's habitat and food availability." (p. 62, Schoen 1969)

In his thesis on the impact of introduced rabbits upon San Juan Island, Stevens (1975) mentions a "*feral European polecat (Mustela putorius) population on the island*" (p. 14), and lists "*European polecat* (*Mustela putorius*)" in Table A.2: Terrestrial mammals of San Juan Island, Washington (p. 128). Stevens (1975, p. 78) also reports that "*predators have only a superficial effect on rabbit numbers.*" Stevens (1975) discusses carnivores in his thesis, section 5.4-Qualitative Interspecific Relationships, where he mentions "*ferret*" and "*European polecat*":

> "There is little distinction between decomposers and scavengers (Odum, 1971), but for clarification, I define scavengers as those macroscopic animals feeding on dead animal matter...The most effective scavengers appear to be *Peromyscus maniculatus*, raccoon, domestic and feral cat, ferret, golden eagle, bald eagle, crow, raven, starling, and glaucous-winged gull. There is a relatively high abundance of scavengers because of the prevalence of rabbit carcasses, but I made no effort to quantify most species except bald and golden eagles... A rough estimate of scavenger numbers might be 200-400 based on observation." (p. 110).
>
> "There are only four known mammal predator species in American Camp: raccoon, domestic dog, domestic cat, and European polecat. The latter three are introduced....The recently discovered polecat population is probably quite low, perhaps six individuals in American Camp owing to the large territories guarded by Mustelids (Walker, 1968)." (p. 112. Stevens 1975)

A later study by the same researcher attributed the rabbit population crash on San Juan Island to a disease, possibly brucellosis, and not predation by ferrets:

> "Although a significant increase in the feral ferret (Mustela putorius) population was observed starting in 1977 (Stevens, unpublished data, 1972-82) and the ferret is locally popularly believed responsible for the rabbit's decline, it is doctrinally and physically inconceivable that a territorial predator can manifest a controlling influence over its prey population (Smith and Slatkin, 1973). And, whatever is affecting the population is doing so

on an island-wide basis and possibly other local islands, especially Lopez Island (1 km distant)...The results of this study have further reduced the possible causes of the decline and have further reinforced the findings of previous studies and speculations...Other than ferrets, the predator population has remained stable over the years. During this study period, only three ferrets were observed in the study area during night hours, compared with four feral cats, three dogs, four deer, one raccoon, about a dozen Peromyseus [sic], no hunters, one Great Horned Owl (Bubo virginianus), and several hundred rabbits. The only significant discovery was the disruption of the female reproductive physiology and reproductive processes. Three potential causes of this female disorder are: plant nutritional deficiency, plant estrogens, and a selective disease of the reproductive tract...In addition to the above evidence and suspicions for a brucellosis epizootic in the San Juan rabbits, a secondary piece of information has arisen...In conclusion, based on the above information, it appears that the San Juan rabbit population has suffered a decline associated with reduced reproduction over the past two years." (p. 7-10, Stevens 1982)

The unpublished report *Status of ferrets and other introduced animals on San Juan Island* by Stevens (1979) was not available for review. To follow up on these earlier accounts, inquiries were made as to the presence of ferrets on San Juan Island. Todd Trapp (Biologist, San Juan Island National Historical Park) sent two email replies:

"Hi, Thank you for your interest in nonnative ferrets (Mustela putorius) on San Juan Island. I have reviewed our files and found several references to ferrets in the park. The first documented reference of ferrets at San Juan Island National Historical Park was during an MS study on the European rabbit population in our American Camp unit of the park by W. F. Stevens in 1972-74. He captured three individuals in traps. In a later letter, he references road-kill censuses on the island in which he recorded 2/year in 1977, 4/ year in 1978, and 15 to date (15 October, 1979) in 1979. In another letter from 1991 (not dated), Stevens states that the ferrets were still present on the island in May 1983 when he left the island, but that their population was declining, coinciding with a crash in the rabbit population at American Camp. In that same letter, he notes anecdotally that his "contacts" on the island state that ferrets are still around. Presumably, the ferrets were either escapes or introduced by island residents to control the rabbits. In another report I came across from 1975 referencing mammals in the islands, ferrets were only known from San Juan Island. I talked with our Superintendent, who has been here at San Juan Island National Historical Park for the last eight years, and he has heard no reports of ferrets being seen on the island or in the park during that time. You might also contact Dr. Thor Hanson, an independent biologist on San Juan Island, as he may have more information on ferrets than I. His email is: thor@rockisland.com. Sorry I can not be of more help. I will be happy to send you these references if you would like. Best of luck with your research. Sincerely, - Todd Trapp." (Todd Trapp, pers. comm., March 3, 2010).

"Dr. Graening, I will send the few references I have to you. As far as I know, there is no extant ferret population present on San Juan Island. Cheers, Todd." (Todd Trapp, pers. comm., March 3, 2010).

Biologist Dr. Thor Hanson's reply:

"This sounds like an interesting study. I don't have much to add to what Todd has already given you, but it's interesting that Schoen (1972) makes no mention of Mustela putorius. His field work was conducted in 1971-1972, and though he was trapping *Peromyscus*, his thesis gives a decent review of SJI mammals. Another lead, at least for documenting their demise, might be to talk with Shona Aitken at the Wolf Hollow Wildlife Rehabilitation Center here on the island. Every mammal species in the vicinity makes its way to them sooner or later, and she might have a date for the last ferret they treated. Best of luck, and sorry I don't have more information. – Thor." (Thor Hanson, pers. comm. March 3, 2010).

Brian Kellogg (Washington Falconers Association) replied:

"Hi Geo, a bunch of us used ferrets on San Juan Is in the late 70's to mid 80's. A few were lost and never recovered, but to my knowledge it was very few. I think there were several gun hunters also using ferrets at that time and even before us. I never saw a feral ferret while hawking on the island in all those years and never lost one personally. I know of no documentation of lost ferrets on the islands. Sorry I can't be of more help to you... It was a long time ago. Regards, Brian." (Brian Kellogg, pers. comm., April 6, 2010).

In the 1988 questionnaire by W. Phillips *et al.* (California Domestic Ferret Alliance), Washington State Nongame Program Manger T. Juelson responded:

> "I understand that there have been attempts to use ferrets to control populations of exotic European rabbits on San Juan and Hat Islands of Puget Sound. I also understand that during the time the rabbit populations were healthy, ferrets were frequently observed in conjunction with those colonies. Thos rabbit populations dramatically decreased a few years ago, and I have been unable to find anyone who has observed a ferret there since. I am convinced that the only way a European ferret can survive in the wild in Washington is in conjunction with the concentration of an exotic colonial species, such as the European rabbit."

On the Jurek and Ryan (1999) questionnaire, agency personnel from the Washington Department of Fish and Wildlife answered as follows:

> Do you have evidence of the following?
>
> Cases of stray individuals in urban areas: Rare.
>
> Free-living individuals documented as surviving more than a few days in wild: Yes.
>
> Breeding suspected in the wild now: No or in the past: Yes.
>
> Breeding individuals documented in the wild now: No or in the past: No
>
> An established breeding population of domestic ferrets in your state: "probably does not exist"

In his response to our CSUS questionnaire, Eric Cummins (Washington Department of Fish and Wildlife) checked "*Don't know exactly, but my professional estimate is: 1 to 10 populations*" on the questionnaire, and added the comment, "*There are escaped ferrets used in falconry in San Juan Islands, specimens in UPS Slater Museum.*"

8.4.7.1. ***Summary and Opinion***

Ferrets were apparently introduced into the San Juan Archipelago in the mid 20th century, either by purposeful introduction to counter the impacts of introduced rabbits, or by the accidental release by hunters during ferreting, or a combination of both. There is some anectodal evidence that a feral ferret population may have persisted for several years. The decline of feral ferrets may have coincided with the reduction in rabbit populations on San Juan Island. Currently, agency personnel and academic biologists cannot document any ferrets in the San Juan Archipelago. Currently, there is no evidence of any feral breeding population of ferrets in Washington. Agency personnel that responded to questionnaires did not express and serious concern over the possible establishment of ferrets in Washington.

8.4.8. Alaska Case Study

In 1986, the Alaska Division of Public Health reported the following:

> "The Epidemiology Office has investigated five ferret bites involving six Alaskans since 1985. Four of these incidents have occurred since April 1986. In one incident, a Wasilla resident was driving home when he saw a ferret hopping across the road. He let the ferret into his car. The ferret then attacked his daughter and him, biting them both on the ankles."

In the same bulletin, the Alaska Division of Public Health concluded:

> "Many states, including California and South Carolina, restrict the importation of ferrets to protect public health and to prevent ferrets from establishing feral populations. Should ferrets escape in Alaska, they may establish feral populations that could harm Alaska's indigenous wildlife. Possession of ferrets will lead to more injuries to children and adults and there is a possibility that rabies will be transmitted.
>
> Public Health Warning: The Division of Public Health advises Alaskans not to purchase ferrets. Ferrets should be banned from public schools. Individuals should consider more suitable alternatives as pets for their children. Importation of ferrets to Alaska should be banned." (Alaska Epidemiology Office 1986)

In 1987, Robert Wood (Area Management Biologist, Game Division, Ketchikan) reported the following:

> "28 Dec 85 - One ferret caught in a mink set on Joe Island which is 2 miles north of the north end of the Ketchikan road system by Jason Sapp, whose father managed the Grant Island Fishing Resort.

29 Dec 85 - the same trapper caught a second ferret on Joe Island and brought it to the ADF&G office alive. I am almost positive it was a female. They quit trapping on Joe Island as soon as they realized what the ferrets were.

About late December 1985 - a ferret was killed by a car at the Ward Cove turn off and taken to the Whiskey Hollow Taxidermy in Ketchikan owned by Randy Jahnke. I have seen this hide.

There was a report of up to 10 more ferrets caught on Joe Island during the 1985-86 trapping season but I could find no one who could verify that.

Late December 1986 - a male ferret was caught in a mink / marten set on the beach in Carrol Inlet at Shoal Cove about 20 miles from Ketchikan by Mike Wood. It was a very fat healthy animal. There is a logging camp and a US Coast Guard Loran Station within 1 to 2 miles of where the ferret was caught.

The taxidermist who skinned at least 2 of the 3 ferrets from the 1985-86 season said the animals were very fat. How long any of the ferrets were in the wild on their own is unknown. I do not know of anyone trapping on Joe Island during the 1986-87 season, and the only ferret reported to me this year was the one from Carroll Inlet." (Wood 1987a)

In a second letter and in correspondence with Ron Jurek (CDFG), biologist Robert Wood (Alaska Department of Fish and Game) speculated that that these instances of feral ferrets derived from intentional or unintentional releases by pet owners, and that the ferrets were in good condition (*i.e.*, well fed), but not necessarily breeding (Wood 1987b; Jurek Memo 1997)

On the Jurek and Ryan (1999) questionnaire, agency personnel from the Alaska Department of Fish and Game Division of Wildlife Conservation answered as follows:

Do you have evidence of the following?

Cases of stray individuals in urban areas: Sporadic.
Free-living individuals documented as surviving more than a few days in wild: Yes.
Breeding suspected in the wild now: [blank] or in the past: Yes.
Breeding individuals documented in the wild now: No or in the past: No

Environmental concerns: "Concern that a wild (feral) population could be detrimental to indigenous prey populations, displace indigenous mustelids or other animals, and introduce or spread disease. However, in most parts of the state, ferrets probably could not survive through the winter."

Alaska Department of Natural Resources Director F. Miele responded, "*We have not collected this data*" in the Jurek and Ryan (1999) questionnaire.

Tom Schumacher (Alaska Department of Fish and Game, Division of Wildlife Conservation) responded to our CSUS questionnaire, and wrote the following in his cover letter:

"I have attached a completed survey form for the state of Alaska. Ferrets are considered pets/domestic animals similar to dogs and cats and may be possessed without a permit. I asked area management biologists throughout the state about the presence of or problems with ferrets in their areas, and received virtually no response. Alaska's climate and healthy native predator populations likely limit the ability of ferrets to survive outside of captivity. Please contact me if you have follow-up questions."
(Tom Schumacher, Alaska Department of Fish and Game, Division of Wildlife Conservation, email on September 25, 2009)

In his questionnaire responses, Schumacher did not have evidence of ferrets harassing or killing livestock or wildlife, but estimated 1 to 10 instances per year of ferrets harassing or killing livestock and wildlife, and did not know if abandoned or stray ferrets existed in Alaska; he checked "*No, or probably not*" on the question of breeding populations of feral ferrets existing in Alaska.

8.4.8.1. Summary and Opinion

Instances of stray or feral ferrets have occurred in Alaska, but there is no convincing evidence of the establishment of any feral breeding population. Alaska agency personnel had historically expressed concern over the possible establishment of ferrets in their State in the 1980s, but recent communications indicate that Alaska agency personnel are not as concerned.

8.4.9. Florida Case Study

Layne (1997) does not list the ferret (or any mustelid) as one of the nonindigenous mammals known or believed to have become established in Florida. However, Layne (1997) does document the presence of abandoned or stray ferrets in Florida, and did conclude that the ferret has the potential to become an established exotica mammal in Florida. The following pertinent excerpts are provided:

> "Three major factors contribute to Florida's vulnerability to establishment of nonindigenous mammals. The first is an abundant supply of candidate species, including a large population of exotic wildlife pets, particularly in southern Florida, and numerous tourist attractions, game ranches, and wild-animal importers and dealers. The second factor is a climatic range suitable for both temperate and tropical species. The third is a broad range of natural aquatic, wetland, and upland habitats and human-altered landscapes. To these can be added hurricanes, which may liberate and disperse captive nonindigenous wildlife as well as domestic animals." (pp. 157-158, Layne 1997)
>
> "Who Succeeds? Established nonindigenous mammals in Florida differ greatly in their success in expanding their ranges and populations. At one extreme is the black-tailed jackrabbit, which has failed to spread from the general area in which it was introduced some 60 years ago; at the other is the red fox, which has blanketed the state in about half that time. There are no obvious correlations between taxonomic group, geographic origin, circumstances of introduction, body size, life history traits, or other factors and the success of introduced species in Florida. Thus we are left to conclude that species have done poorly or well for different reasons." (p. 177, Layne 1997)
>
> "More than 50 species of free-ranging nonindigenous mammals have been recorded in Florida...A few examples will illustrate the diversity: the binturong, hedgehog, lesser anteater, baboon, chinchilla, mongoose, ferret, ocelot, African lion, Indian elephant, kinkajou, and even a marine species—the California sea lion. Most species are known from a few records of individuals recently escaped or released from captivity. In most cases, if not quickly recaptured or killed, these animals probably do not survive long in the wild. Exceptions include a jaguar shot in 1968 near Felsmere, Indian River County, that had been seen in the area over a two-year period." (p. 158, Layne 1997)
>
> "Given the many factors determining the chance of arrival and success or failure of an exotic species in a new environment, any attempt to predict future additions to the list [of nonindigenous mammals in Florida] must be highly speculative. Nonetheless, their popularity as pets, the known escapes or releases, and the evidence of persistence of some individuals in the wild suggest that the ferret (*Mustela putorius*) and ocelot (*Felis pardalis*) may eventually establish wild breeding populations in Florida....Ferrets were captured in Highlands Hammock State Park (Highlands County) in 1978 and Jonathan Dickinson State Park (Martin County) in 1979 (R. Roberts, pers. comm.). The latter animal may have been one that was lost by a park visitor eight months before. Other sightings of ferrets in the wild in Highlands and DeSoto counties occurred in 1973 and 1987. Of all the nonindigenous mammals that have appeared in Florida, the species most likely to become a serious pest if ever established is the mongoose (*Herpestes auropunctatus*), which has had a devastating effect on the indigenous faunas of the Caribbean islands on which it was introduced....Van Gelder (1979) has reviewed records of introductions of the species and suggests that it is less successful at becoming established in mainland habitats than on islands." (pp. 185-186, Layne 1997).

We were not able to get any Florida agency personnel to give a written response to the questionnaire, but during phone queries, Dr. Thomas Holt, State Veterinarian, Division of Animal Industry, Florida Department of Agriculture and Consumer Services, referred us to one of his staff members—Daniel Stanke. In a phone conversation on 12 March 2010, Mr. Stanke stated that he has not had any cases of domestic ferrets (or wild ferrets) harassing or attacking wildlife,

poultry, or livestock in the entirety of his career with the Department. Note that the Fish and Wildlife Conservation Commission did not respond to our questionnaire or data requests. However, the Fish and Wildlife Conservation Commission does have a webpage pertaining to the ferret, which is copied verbatim as follows:

"Florida's Nonnative Wildlife. Species detail. Ferret - *Mustela putorius*

First year: 1970s

Extirpated year:

Established status: Species are present but not confirmed to be breeding. Population persists only with repeated introductions and/or escapes of individuals.

Estimated Florida range: 3 counties (DeSoto, Highlands, Martin). Not reported breeding

Statewide trend: Unknown status

Threats to natives: Impact on native species unknown, but can transmit rabies and is potentially an important predator.

Species Account: Releases of ferrets kept as pets account for many of the sightings of this animal. No reported breeding in the wild. Accidentally and intentionally released pets are probably present on occasion throughout the state, especially near urban areas.

References: Layne, J. 1997. Nonindigenous Mammals. Pages 157-186 in Strangers in Paradise: impact and management of nonindigenous species in Florida (Simberloff, D., D. Schmitz, and T. Brown, eds.). Island Press, Washington, D. C."

) (Florida Fish and Wildlife Conservation Commission 2010)

8.4.9.1. Summary and Opinion

Instances of stray or feral ferrets have occurred in Florida, but there is no evidence of the establishment of any feral breeding population.

8.4.10. California Case Study

The following references to feral ferrets were found during the literature review:

"According to information provided by DFG, there is scant evidence of feral ferret populations in California, at present. However, several years ago, a ferret kitten [sic] was found near its mother after the adult had been hit by an automobile in Kern County. It was concluded that the female had bred in the area. Since then, a male and female pair of ferrets have been live-trapped at Folsom Lake (Placer County), and another pair was trapped in Sonoma County. Sightings of individual ferrets, made by knowledgeable and reliable observers, also have been reported from Sonoma, Napa, Riverside, and San Francisco counties. In the latter instance, the ferret was emerging from a burrow at Candlestick Point Recreation Area. Animal control personnel and county public health laboratory directors in Northern California frequently report observations and captures of single ferrets. It is usually impossible to distinguish escaped or released pets from feral animals, although the former seem more likely to be observed in populated areas. Similarly, ferrets that approach people, sometimes inflicting bites as persons pet them, are likely to be stray pets. At this time, the available information suggests that if feral ferret populations exist in California, they may not yet be beyond control. It must be emphasized, though, that feral ferrets abound in other states with climates far more severe than occurs in most of California, and that California's poultry producing and game bird producing areas provide habitats especially attractive to ferrets." (pp. 3-4, Constantine and Kizer 1988).

"From 1984 into 1986 a commercial vertebrate pest control agent in Sonoma, California, trapped two European ferrets in a creek bed near Sabastopol, saw one on California State Highway 12 and Sonoma Creek, one near the Napa River in Napa and one come up from a burrow in Candlestick Park, San Francisco (Hunt 1986). As a detection biologist with CDFA the author saw a European ferret crossing US 95 near Lost Lake north of Blythe. Reports were received without documentation of other European ferret sightings in Southern California." (p. 211, Hitchcock 1994)

"In California, many stray ferrets are found every year. From 1989 to 1998, 47 stray ferrets from communities in the general Sacramento region of the State were transported to the Department of Fish and Game field station for

temporary holding. This represents but a small fraction of what escapes in the State as a whole. Such rescued ferrets are held until transported by volunteers to states where ferrets are legal." (Jurek 2001)

"At least five pet ferrets have developed rabies in the United States, including an illegal escapee that was trapped in California in 1985." (p. 18, Constantine 1986).

"Instances of Ferrets Being Illegally Used as Hunting Animals in California:

In February 1973, California Department of Food and Agriculture reported that a white ferret was found in possession of two falconers who had been stopped by a State Park Ranger at O'Neill Reservoir, Merced County. The ferret was confiscated by Department of Fish and Game.

A recent poaching case 'resulted in the conviction of a suspect who possessed several ferrets at his residence and was using them to hunt rabbits. He was fined $370 in Tulare County and $1,215 in Kings County, totaling $1,515, one day in jail, and three years probation.' - Calif. Dep. Fish & Game, Region 4 News, February 1996."
(Jurek 2001)

"Like pet ducks, cats, and rabbits, some pet ferrets wind up in public parks. 'It's incredible,' says Joe Didonato, wildlife specialist at the East Bay Regional Parks District. 'People aren't even supposed to have these in the state and then they go and let them out in the park. Fortunately, the last ferrets (we found) were so tame they walked right up to us.' So far as is known, there are no ferrets loose in California now. Should any become successfully feral, they would place additional stress on the already endangered populations of the California clapper rail and other native species." (p. 27, Gustaitis and McGrath 1992)

In 1987 in correspondence with W. Phillips, T. Burr (Director, Natural Resources Department, Marine Corps Camp Pendleton) mentioned the occasional confiscation of pet ferrets at Camp Pendleton, and that each year their animal shelter and warden personnel receive several calls regarding "black-footed ferrets"; in those cases where visual sightings can be repeated, the animal was identified as a long-tailed weasel (*M. frenata*) (California Domestic Ferret Alliance 1998, in Californians for Ferret Legalization 2000)

In a 1986 letter to the California Fish and Game Commission, Dr. Stephen Plank (Public Health Officer, Shasta County Department of Public Health) stated:

"From general knowledge of ferrets and limited personal experience with them, I urge that they continue to be out-lawed as pets in California. A few months ago, one was trapped in neighboring Tehama County. The fur on its neck showed signs of having been worn by a collar, suggesting that it was an escaped (or thrown out) pet. Not wanting to destroy the cute little creature, but knowing that it could not be kept by a private party, the trapper gave it to our Animal Control staff. Some time later, after nipping staff, a veterinarian, and his assistant, the ferret became ill and then, quite shortly, died. Because these people were trained, alert professionals, they had us examine the brain for rabies. It was strongly positive. If ferrets become legal in California, cases like the above would be repeated on a large scale, except that few of those 'adopting' the charming strays would have the sophistication of those exposed here. Inevitably, there would be human rabies victims. There is no commercial, social, or humanitarian benefit from allowing ferrets into California which can possibly justify subjecting the public to such an abhorrent risk."

In the Jurek and Ryan (1999), the response given by California (Ron Jurek and Dr. Pam Swift, CDFG Wildlife Management Division) was as follows:

Cases of stray individuals in urban areas: Sporadic
Free-living individuals documented as surviving more than a few days in the wild: No
Breeding suspected in the wild now: No or in the past: No

In his response to our CSUS questionnaire, Dr. Kent Fowler (California Department of Food and Agriculture) responded "*Don't know*" to instances of ferrets harassing livestock or wildlife, to stray ferrets, and to established feral populations. CDFG did not respond to our CSUS questionnaire.

8.4.10.1. Summary and Opinion

Instances of stray or feral ferrets have occurred in California, but there is no convincing evidence of the establishment of any feral breeding population.

8.5. SUMMARY OF AGENCY QUESTIONNAIRE RESPONSES

8.5.1. Summary of the California Domestic Ferret Alliance Questionnaire

In 1988, W. Phillips *et al.* (California Domestic Ferret Alliance) distributed their results of their *50 State Survey On the Supposed Existence of Feral Populations of Domestic Ferrets In Each State* (reprinted in: Californians for Ferret Legalization 2000), and stated this conclusion:

> "In response to their purported concerns about feral populations, we did a survey of all 50 state Departments of Fish and Game and asked each for evidence of any feral populations of domestic ferrets. In every case (including California), the answer was 'no evidence.' By comparison, the same question concerning cats or dogs would yield much different results." (Carley 1994)

Jurek (2001) disputed the findings in that survey that State agencies provided no evidence of feral ferrets in their states. In interpreting the response letters and correspondence between W. Phillips and state agencies, we also disagree with the conclusion. Some State agencies reported data deficiencies, which is not exactly the same as "*no evidence*"; other State agencies report feral individuals in their States, and expressed concern over the possibility of these individuals establishing breeding populations. Some excerpts are reproduced verbatim here:

- Alaska Department of Natural Resources Director F. Miele responded, "*We have not collected this data*"
- Georgia Department of Natural Resources Senior Wildlife Biologist J. Scharnagel responded, "*While there have been a number of documented instances of ferrets escaping and being released into the wild in this state, it has not yet been documented that the animal has established feral populations.*"
- Idaho Fish and Game Bureau of Wildlife staff Craig Groves responded, "*There are no statutes concerning this species in Idaho and to the best of our knowledge there are no known feral ferret populations. However, there are undoubtedly some domestic ferret individuals which escape captivity and become feral.*"
- Iowa Department of Natural Resources Furbearer Specialist R. Andrews responded, "*We are not aware of any feral colonies of domestic ferrets in Iowa. Occasionally we do get reports of single animals being sighted around the state. We believe most of these are escapees from careless owners. We are not doing any research on the critters. Our contention concurs with you in that we do not believe they can survive in the wild.*"
- Louisiana Department of Wildlife and Fisheries staff J. Angello responded, "*There are no known feral populations of domestic ferrets in Louisiana. There are certainly escaped individuals, because we occasionally get nuisance complaints about them in metropolitan areas.*"
- Maryland Department of Natural Resources Director D. MacLauchlan responded, "*While we know of instances where individual ferrets have escaped from captivity, we know of no feral, viable population which has become established here. We cannot, however, ensure that this has not happened.*"
- Missouri Department of Conservation Assistant Wildlife Division Chief did not answer the question about whether or not a feral ferret population existed in Missouri, but simply stated that ferrets were considered domestic animals and not regulated by his Department.
- Montana Department of Fish, Wildlife, and Parks Nongame Coordinator D. Flath responded, "*The domestic ferret occurs in the wild in Montana only to a limited extent. Reports over the years generally suggest that released animals do not over-winter successfully. Thus a 'population' does not exist. Domestic ferrets in the wild occur only as current year feral animals.*"
- Nebraska Game and Parks Commission Nongame Wildlife Biologist F. Andelt responded, "*We have had a few domestic ferrets found in the wild in the past but we do not believe that any self-sustaining population exists.*"

- New Hampshire Fish and Game Department Chief H. Howell responded, "*We occasionally have ferrets trapped or road-killed in New Hampshire.*"
- North Dakota Game and Fish Department Natural Resource Zoologist R. Krell responded, "*There are no known feral populations of domestic ferrets in North Dakota. However, occasionally there are domestic ferrets that escape their owners. These animals are of concern to our Department as they pose a threat to ground nesting birds and mammals. In addition, domestic ferrets loose in the wild are considered to be of concern from the standpoint of rabies transmission.*"
- Oregon Department of Fish and Wildlife Staff Biologist J. Thiebes responded, "*Oregon has no known feral populations. Our field biologists do pick up an occasional ferret and are concerned about any potential population becoming established.*"
- South Dakota Department of Game, Fish and Parks Assistant Director G. Vandel responded, "*I have heard reports of domestic ferrets being released into the wild after outliving their use as pets but survival in the wild has never been documented.*"
- Texas agency personnel did not answer the question about whether or not a feral ferret population existed in their state.
- Utah Wildlife Resources Division Mammals Program Coordinator K. Elowe responded, "*Although we have a few cases where people have live-trapped M. furo (usually in close proximity to residences), we do not know of any feral populations of domestic ferrets.*"
- Washington State Nongame Program Manger T. Juelson responded, "*I understand that there have been attempts to use ferrets to control populations of exotic European rabbits on San Juan and Hat Islands of Puget Sound. I also understand that during the time the rabbit populations were healthy, ferrets were frequently observed in conjunction with those colonies. Thos rabbit populations dramatically decreased a few years ago, and I have been unable to find anyone who has observed a ferret there since. I am convinced that the only way a European ferret can survive in the wild in Washington is in conjunction with the concentration of an exotic colonial species, such as the European rabbit.*"

8.5.2. Summary of the Jurek and Ryan (1999) Questionnaire

The following questionnaire results are copied verbatim from Jurek and Ryan (1999):

"Stray Ferrets in Urban Areas. Most states reported having knowledge of stray ferrets in urban areas. Fifteen states (30%) reported 'None', 28 states (57%) reported them to be 'rare' or 'sporadic', and New Mexico and Georgia (4%) reported them to be 'Common' and 'Frequent', respectively. Five states (10%) reported 'Unknown' or gave no response." (p. 10, Jurek and Ryan 1999)

"Ferrets Surviving in the Wild. Five States (10%) (Alaska, Connecticut, Massachusetts, Washington and Wyoming) reported free-living individual ferrets documented as having survived more than a few days in the wild. Three states (Kansas, Montana and Rhode Island) (6%) reported 'Unknown'. The other states reported having no such documentation." (p. 10, Jurek and Ryan 1999)

Ferrets Breeding in the Wild. No state reported suspected breeding or documented breeding by ferrets in the wild now (1996/97). Three states (6%) (Alaska, New Mexico, and Washington) reported suspected breeding by ferrets in the wild in the past. No state reported documented breeding by ferrets in the past." (p. 10, Jurek and Ryan 1999)

"Knowledge of Breeding Populations. Asked about the potential for having established breeding populations of ferrets in the state, no state wildlife agency marked these possibilities: 'definitely exists,' 'probably exists,' 'definitely existed but definitely no longer exists', or 'definitely existed but current status is unknown.' States could mark more than one category. Ten states (20%) replied that an established breeding population 'definitely does not exist', 27 (54%) replied that one 'probably does not exist', and five (10%) replied that one 'would not likely exist'. Seven states (14%) replied that such a population 'cannot be determined without a special survey'. Three (6%) states (Indiana, Kansas and Texas) replied 'Unknown'. No state wildlife agency marked the option that an established breeding population 'would not be a serious concern'." (p. 10, Jurek and Ryan 1999)

"Effort to Assess the Status of Ferrets in the Wild. Asked about the amount of effort the state wildlife agencies have made to assess the status of ferrets in the wild, 43 states (86%) reported 'None'. Respondents in 34 of the states reported that it was 'not considered to be important', and six of the states reported that such assessment would be 'desirable but not feasible'." (p. 11, Jurek and Ryan 1999)

"Method of Assessing Status of Ferrets in the Wild. Seventeen states indicated what method is used to assess status of ferrets in the wild. Of the seven states that reported having made some level of effort, six checked 'opportunistically document', one marked 'thoroughly check out all reports', one checked 'special sampling', and two checked 'concerted surveys.' Ten states that did not report making some level of effort to assess status of ferrets in the wild indicated that they 'opportunistically document.' No state agency responded that they 'routinely check during area studies'." (p. 11, Jurek and Ryan 1999)

"Agency Action Upon Discovery of Established Breeding Population. Each state marked one or more of the following responses about how breeding populations of ferrets would be handled:

Action	Percent	Number (of 50)
Attempt eradication	58%	29
Local area management decision	18	9
No action would be taken	4	2
Other:		
Capture and turn over to ferret groups	2	1
Unknown/undecided/determine extent then act	24	12

(p. 12, Jurek and Ryan 1999)

8.5.3. Summary of the CSUS Questionnaire

The following tables summarize CSUS questionnaire results pertaining to stray ferrets, breeding populations, and wildlife impacts.

Are there instances of domesticated ferrets killing or harassing wildlife in your State?								
	Don't Know	No	1 to 10	10 to 100	100 to 1,000	est. 0-1/yr	est. 1-10/yr	est. 10-100/yr
Response of States & Provinces	AR(2), AZ(2), CA, CO, CT(2), DC, DE, DE, HI, ID, KY(2), MD, ME, MI, MN, MO, NB, NC, ND, NJ, NY, OH, PA, SC, SD, TN, WA, WA, WA, WI	AL, GA, IA(2), IL(2), IN, KS, MA, MN, MS, MT, NH, NJ, NS, NY, OK, OR, RI, SD, TX, UT, VI, VT, WA, WV, WY	blank	blank	blank	LA, NE, NV, WI, WY	AK, OK	NM

Are there abandoned, stray, or otherwise unconfined domesticated ferrets in your State?					
	No	Don't Know	Yes	Est. 1 to 10	Est. 10 to 100
Response of States & Provinces	HI, MA, NH, NJ, OR, SD, UT, WV	AK, AL, AR, AZ, BC, CA, CO, CT(2), DE(2), GA, IA, ID, IL(2), IN, KS, KY(2), LA, MD, ME, MN(2), MO, MT, NB, NC, NE, NJ, NM, NV, NY(2), OH, OK, PA, RI, SC, SD, TN, VT, WA, WY	WA(2)*	DC, IA, MI, ND, OK, VI, WA, WI, WY	AZ, NS, SD*, WI
* These responses were researched further and discussed later.					

Have any unconfined domesticated ferrets established a (feral) breeding population in your State?						
	No, or probably not	Don't know	1 to 10	10 to 100	100 to 1,000	Est. 1 to 10
Response of States & Provinces	AK, AL, AZ, BC, CO, DE, DE, GA, HI, IA, IL, IN, KS, KY(2), MA, ME, MI, MN(2), MO, MT, NB, ND, NE, NH, NJ, NM, NS, NV, NY(2), OH, OK(2), PA, RI, SC, SD(2), VI, VT, WA(2), WI(2), WV, WY(2)	AR(2), AZ, BC, CA, CT(2), DC, IA, ID, IL, LA, MD, MN, NC, NJ, OR, TN				SD*, WA*

Hawai'i (K. Minami, Dept. of Agriculture) reported no escaped or wild ferrets, and no breeding populations.

Answering differently than the other agency respondent from South Dakota, Eileen Dowd Stukel (Wildlife Diversity Coordinator, South Dakota Dept. of Game, Fish, and Parks) checked "*Don't know exactly, but my professional estimate is: 1 to 10 populations*" on the questionnaire, but she provided no explanation for this estimate. In a follow up phone conversation in March 2010, Dr. Graening inquired as to the specifics of this answer. Ms. Stukel stated that she had heard such information from a colleague—Dr. Kent Jensen (Department of Wildlife and Fisheries Science, South Dakota State University). In April 2010, Dr. Graening spoke to Dr. Jensen about this reference. Dr. Jensen knew of no cases of ferrets escaping or establishing breeding populations in South Dakota.

In the CSUS questionnaire, most State agencies indicated that censusing stray or feral ferrets was not important:

> Has your State made any effort to assess the status of domesticated ferrets in the wild/feral/outside of captivity?
>
> 'No, not considered to be important' = AK, AL, AR, AZ, BC(2), CO, CT, DC, DE, GA, IA(2), ID, IL, IN, KS, KY(2), LA, MA, ME, MI, MN(3), MO, MT, NB, NC, ND, NE, NH, NJ(2), NM, NS, NV, NY(2), OH, OK(2), OR, PA, RI, SC, SD, VI, VT, WA(3), WI(2)I, WV, WY(2),
>
> 'No, but desirable' = MD, MS
>
> 'Yes' = HI, TN

Thus, 41 States and 2 Provinces responded that it was not considered important to assess the status of domesticated ferrets in the wild/feral/outside of captivity.

In the CSUS questionnaire, several State agencies indicated that no action would be taken upon discovery of stray or feral ferrets:

> What action would be taken by your agency upon discovery of an abandoned, escaped, feral, or otherwise unconfined domesticated ferret?
>
> 'No action would be taken' = AZ, AR, BC(2), DE, IA, IL, KY, MN(2), NY(2), OR, VT, WA, WV, WY
>
> 'Defer to local government management decision', 'Live trap and take to animal shelter (presumed lost pet)', 'Live trap and euthanize', 'Take by any means', or 'Other action' = AK, AL, AR, CA, CO, CT, CT, DC, DE, GA, HI, IA, ID, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MT, NB, NC, ND, NE, NH, NJ(2), NM, NS, NV, OH, OK(2), PA, RI, SC, SD, TN, TX, VI, WA(3), WI(2), WV, WY
>
> What action would be taken by your agency upon discovery of an established (feral) breeding population of domesticated ferrets?
>
> 'No action would be taken' = AR, BC, IA, KS, KY(2), MD, NJ, OR, VT, WA, WI

'Defer to local government management decision', 'Live trap and take to animal shelter (presumed lost pet)', 'Live trap and euthanize', 'Take by any means', or 'Other action' = AK, AL, AR, AZ, CA, CO, CT(2), DC, DE(2), GA, HI, IA, ID, IL, IN, LA, MA, ME, MI, MN(3), MO, MT, NB, NC, ND, NE, NH, NJ, NM, NS, NV, NY(2), OH, OK(2), PA, RI, SC, SD, TN, TX, VI, WA(2), WI, WV, WY(2)

Furthermore, many states do not even regulate the release of ferrets into the wild:

Do you have state regulations that clearly prohibit the release of domesticated ferrets from captivity?
'Yes' = AK, AR, BC, CA, CT, GA, HI, IA, ID, IL, KY(2), MA, MI, MO, MT, NB, ND, NE, NJ, NS, NV, PA, RI, TN, VI,

'No' = AL, AZ, CO, DC, DE, IA, IN, KS, LA, MD, MN(3), NC, NH, NJ, NM, NY(2), OH, OK(2), OR, SC, SD, VT, WA(3), WI(2), WV, WY(2)

Thus, 22 States have no regulations against release of ferrets from captivity. California Fish and Game Code (14 CCR § 671.6) prohibits the release of captive wild animals.

8.5.4. Summary and Opinion

Surveys of State agencies reveal a large data deficiency in the enumeration of stray mustelids, or non-native wildlife in general, in the USA. In our CSUS questionnaire, the majority of State agency personnel responded "*Don't know*" when asked about ferrets impacting wildlife or the existence of stray or feral ferrets in their States. A large majority of State agency personnel responded that there were not, or probably were not, any established feral ferret breeding populations in the their States. More surprisingly, 41 States and 2 Provinces responded that it was not considered important to assess the status of domesticated ferrets in the wild, and 22 States have no regulations against release of ferrets from captivity into the wild. Only California and Hawai'i agency personnel gave strong objections to the importation or possession of ferrets.

8.6. POTENTIAL MITIGATION MEASURES

The establishment of a feral breeding population of ferrets in California is a potentially significant impact upon wildlife, especially as an incremental contribution to the cumulative impacts upon wildlife from statewide factors such as habitat loss and degradation, invasive species, and even climate change. Discussed next are potential mitigation measures.

For CDFG to support a legalization action, CDFG is likely to require the following stipulations in such an action:

- Importation of only sterilized ferrets
- No importation or possession of polecat-ferret hybrids or polecats
- No breeding of ferrets, hybrids, or polecats in California
- Prohibition of ferrets on all of California's islands, which are sensitive to exotic mammal introductions
- Prohibition of release of ferrets into the wild

Mandatory sterilization of ferrets is common in the pet industry. Marshall Pet Products, Inc., the largest ferret breeding operation in USA, prepares each pet ferret for sale by first neutering or spaying the ferret, vaccinating the ferret, then tattooing the ear with 2 dots to indicate that the ferret was spayed/neutered and vaccinated, and finally, a "*...secret tattoo to identify the surgeon who does the spay or neuter.*" (Paul Juszczak, Marshall Pet Products, Inc., pers. comm., March 31, 2010). Sterilization is recommended by veterinarians to avoid endocrine diseases and reduce musky odors (*e.g.*, Williams 1984).

An extensive network of shelters and communication systems could be established to handle unwanted or abandoned ferrets. A public outreach / education program could be implemented to disseminate information about the disposition, needs, and proper care of ferrets.

A licensing program and compliance program could be established. Punitive measures could be established to discourage the importation of fertile ferrets, hybrids, or polecats, or the establishment of breeding facilities. The compliance program may need to include scientific training to identify different species of mustelids, especially those specimens within the polecat-ferret spectrum. Phillips and Shimbo (1990) give instances of CDFG game wardens mistaking native weasels for ferrets.

A program for elimination or control of an established feral ferret population could be established. Clapperton (2001) discussed control measures, including trapping, poison bait, biological control agents such as canine distemper, habitat modification, and non-lethal methods. USGS (2008) also discussed control measures.

8.7. SUMMARY AND OPINION

The literature indicates that ferrets can and do escape confinement, and that accidental or intentional releases of ferrets into the environment do occur. It does not appear to be possible to completely eliminate the risk of a ferret escaping confinement in California. Ferrets have some, but not all, of the life history traits of an ideal invader species. The case studies of feral ferrets in New Zealand and other parts of the World demonstrate that mustelids within the polecat-ferret spectrum (*M. putorius sensu lato*) can establish breeding populations and adversely impact wildlife. It is not clear whether the American domesticated pet ferret can be directly compared to these feral populations, and whether they can be assigned the same risk of establishment and adverse impact upon the environment. All of the ideal conditions for establishment of a feral ferret population have not yet been met in California: a moderate climate, a superabundance of preferred prey, a community devoid of competitors and predators, and repeated introductions of large founding populations. The literature is divided on the topic of whether domesticated ferrets can revert to a feral condition and survive in the wild. Predation and competition from California's wildlife may be important factors that limit the success of the establishment of a feral ferret population.

Surveys of State agencies reveal a data deficiency in the enumeration of stray mustelids in the USA. A large majority of State agency personnel responded that there were not, or probably were not, any established feral ferret breeding populations in the their States, and most State agencies responded that it was not considered important to assess the status of domesticated ferrets in the wild. Only California and Hawai'i agency personnel gave strong objections to the importation and possession of ferrets.

Obviously, sterilized ferrets have no potential to establish breeding populations. Popular pet manuals indicate that the breeding of ferrets, and the ownership of hybrids, are desired by a portion of the pro-ferret community. With or without regulations, the State of California cannot completely prevent the importation of fertile ferrets, polecat-ferret hybrids, or polecats. Thus, some risk of fertile ferrets, hybrids, or polecats establishing feral breeding populations in California still remains; no author or scientist has been able to convincingly enumerate that risk. Any ferret legalization actions may need to assure CDFG that there is no possibility that hybrids or polecats are imported into California, or demonstrate that hybrids and polecats do not pose a threat to the environment if they are released into the wild.

The potentially significant impact upon wildlife of the establishment of a feral breeding population of ferrets may need to be analyzed further in the EIR.

9. ANALYSIS OF POTENTIAL AGRICULTURE ISSUES

9.1. PREDATION / AGGRESSION TOWARDS LIVESTOCK

9.1.1. Reports from the Literature

Smallwood and Salmon (1992) provided a review of the literature on the impact of exotic species upon agricultural resources. The polecat's impact on caged poultry is well documented in the literature (e.g. Roots 1976). Some excerpts are provided here:

> "Their usual place of retirement is in woods or coppices situated at no great distance from farms; from whence they issue about the dusk of evening, or later, to prey upon any living thing, of manageable size, which may come

within their reach...Indeed, says Mr. Wood, 'it is a curious fact, that this animal generally kills all the poultry in the apartment it plunders, be they never so many.' But if the Polecat be so formidable an enemy to the farmyard, it is not less so to the game-preserve and the warren. The destruction which it occasions amongst the eggs and young of Pheasants and Partridges, young Hares, and Rabbits, is incalculable..." (pp. 157-158, Bell 1837)

"The Polecat has always been regarded as bloodthirsty vermin (Beddard, 1909), with the reputation of a wanton killer of poultry and other stock, and it is still trapped as such by many estates...As with most carnivores, the number of prey killed by a Polecat is not directly related to the animal's appetite. Perhaps because the hunger threshold below which most aspects of hunting behaviour are suppressed is different from, and commonly much greater than, that which suppresses killing, the sated carnivore cannot help itself continuing to make easy kills. Therefore, if a Polecat gains access to a poultry house or pheasant pen it may slay all the occupants. Often only the brains of the victims are eaten in such a situation." (p. 178, Blandford 1987).

"Henroosts and rabbit hutches are often preyed upon, with results that are quite disastrous, when the size of the animal is considered. It often goes into the holes of the Rodents, and drives out the whole family." (p. 385, Bachrach 1930)

"Feral ferrets are well known to behave like their polecat progenitors (Corbet, 1980), so it is not surprising that they have proved to be exceedingly destructive to small livestock like poultry and rabbits, as well as to native vertebrates. Their sometimes wanton destruction of small animals far beyond their food need wreaks havoc on victimized native populations. Not only may adult animals be killed, but native species populations may be further harmed by the ferret's particular appetite for and ability to reach nestling mammals, birds, and eggs of the latter (ground-nesting species in particular)." (p. 34, Constantine and Kizer 1988)

Published incidences involving ferrets are fewer, and often lack detail:

"Escaped European ferrets have established self-sustaining feral populations, and their attacks on commercial poultry have prompted some states and municipalities to prohibit the sale or ownership of these adaptable predators. Pet ferrets are illegal in California, Massachusetts, South Carolina, Georgia, New Hampshire, New York City, and Washington D.C." (p. 222, Nagami 2004)

"Domestic species such as poultry may also be at risk, especially given the ferret's tendency to 'surplus kill' when presented with large numbers of prey." (p. 9, Markula *et al.* 2009)

"Ferrets were developed by man from polecats, which have a reputation for being extremely bloodthirsty, killing far more than they can devour and indiscriminately attacking any and all animals within range (Johnston, 1903). In addition to killing native animals, polecats also have been reported to ravage small livestock, such as rabbits and poultry. Larger animals may also be attacked...Feral ferrets behave as polecats (Corbet and Ovenden, 1980), and have been known to engage in wholesale slaughtering of livestock (Everitt, 1897; Dolensek and Burn, 1976; Harding, 1915). The savage characteristics of polecats were highly valued and emphasized in man's selective breeding and development of ferrets for killing rats and rabbits..." (p. 15, Constantine and Kizer 1988)

"Ferrets must be kept away from poultry." (Lewington 1988, p.1)

9.1.2. Reports from Agencies

In 1989, W. Phillips *et al.* (California Domestic Ferret Alliance) distributed their results of their questionnaire *50 State Survey On the Effects of Domestic Ferrets On Agricultural Interests In Each State* (reprinted in: Californians for Ferret Legalization 2000). The majority of responses from state agricultural agencies indicated that they did not believe that ferrets were adversely affecting their agricultural industries. However, the following excerpts of responses demonstrate that some agencies were concerned about impacts from ferrets, while others could not make a decision because of data deficiencies:

- California Department of Food and Agriculture Director Henry Voss responded, "*All available information to date indicates that a feral population of ferrets does not occur in California. We have not received any reports of damage to agriculture by ferrets*"
- Delaware Department of Agriculture Executive Assistant M. Owens responded, "*Dr. Towers [State Veterinarian] has also informed me that we have not received many reports of escapes of these animals, however, if they were to become feral they might cause some concern to agricultural interests.*"
- Georgia Department of Agriculture staff member T. Irwin responded, "*We are not aware of any impact this species has had on agriculture in Georgia. This is, however, inconclusive since we are actually not aware of any work that has been done to measure the population or evaluate the impact of this species on agriculture in Georgia.*"
- Illinois Department of Agriculture Assistant to the Director J. Kunkle responded, "*The Illinois Department of Agriculture does not have any data regarding damage to agriculture attributed to Domestic Ferrets.*"
- Indiana Deputy Director of Agriculture did not answer the question.
- Kentucky Department of Agriculture personnel responded that they had no information on the subject.
- Louisiana Department of Agriculture personnel responded that they had no information on the subject. Louisiana Department of Wildlife and Fisheries District Game Biologist R. Love responded, "*I am not aware of any data concerning the effect of domestic ferrets on agriculture in Louisiana. However, the absence of data does not mean there would be no effect, nor would agriculture be our only concern. We have had 3 ferrets captured in the wild and brought to our offices over the past few years that we know about. Fur trapping is a big industry in Louisiana. Approximately 1/3 of the furs exported from the United States annually comes from Louisiana. We are concerned about anything that could interfere with that. We are aware of what happened to other transplant species (e.g. the mongoose in Hawaii and the nutria in Louisiana). Specifically we would be concerned about the ferret's potential of occupying the same niche as the mink or weasel in Louisiana.*"
- Michigan Department of Agriculture personnel did not answer the question.
- Missouri Department of Agriculture personnel responded that they had no information on the subject.
- New Mexico Department of Agriculture personnel responded that they had no information on the subject.
- Oregon Department of Agriculture personnel responded that they had no information on the subject.
- Texas Parks and Wildlife Department Nongame Biologist C. Martin responded, "*Observations of ferrets in the wild have been reported in Texas, but I am not aware of any documented reproduction. Several of these animals are released or escape each year in Texas, so the potential for reproduction does exist, particularly in the neotropical region in south Texas. While the impact of released and escaped ferrets has not been documented, regardless of reproductive success, there is a potential for negative impacts on wildlife, particularly ground-nesting birds.*"
- Virginia Department of Agriculture personnel responded that they had no information on the subject.
- Wisconsin Department of Agriculture personnel responded that they had no information on the subject.
- Wyoming Department of Agriculture personnel responded that they had no information on the subject.

W. Phillips and Assemblyman Jan Goldsmith solicited opinions of agricultural organizations in California regarding the potential impacts of ferrets upon agricultural interests, particularly as it applied to the bill AB2497 (reprinted in Californians for Ferret Legalization 2000), and some results are as follows:

- California Poultry Industry Federation responded in 1994 that ferrets will not hurt the poultry industry
- Pacific Egg & Poultry Association responded in 1994 that "*...there is little concern*".

In 2003, the California Waterfowl Association wrote to Assemblyman Canciamilla, regarding Bill SB89, that:

> "The California Waterfowl Association (CWA) must strongly oppose SB89...until full environmental review shows that they do not pose and environmental threat to our State's native fauna. Our Association continues to strongly believe that legal ownership of ferrets in California will result in the establishment of healthy feral populations of this exotic, predatory species causing significant negative environmental impacts on our native fauna, particularly waterfowl and ground-nesting birds."

In 1994, the California Farm Bureau wrote to the California State Assembly that they opposed Assembly Bill 2497, stating:

> "We believe the temperate climate and diversity of our natural and agricultural environments could result in serious unintended consequences to our wildlife and some domestic animals. Some poultry producers, for example, could experience severe flock depredation. Moreover, threatened or endangered birds and small mammals could also fall victim to the ferret...We should demand California-based research which will answer these concerns...Farmers and ranchers have experienced serious feral cat and dog problems. We find the prospect of a new potential pest unsavory."

In 1985, Clare Berryhill (Director, California Department of Food and Agriculture, wrote to the California Fish and Game Commission to explain the Departments policy on opposing any permit requests for the importation or possession of ferrets, stating:

> "Some of the reasons for our policy to remain unchanged are: 1) With our system of exclusion and detection, we feel we can maintain a state free of feral populations of ferrets that may establish if ferrets were allowed to enter the state. 2) If feral populations did establish, we have very few tools to eradicate such a population. 3) Upon establishment of a feral population, there undoubtedly would be an undesirable impact on poultry production, both commercial and backyard, within the state....5) There is also concern from the Animal Damage Control sector on increased costs if feral populations were to occur..."

The results of the CSUS questionnaires section on impacts to livestock are presented in the following table.

Are there instances of domesticated ferrets killing or otherwise harassing livestock in your State?								
	Don't Know	No	1 to 10	10 to 100	100 to 1,000	est. 0-1/yr	est. 1-10/yr	est. 10-100/yr
Response of States & Provinces	AR(2), AZ(2), BC(2), CA, DE, ID, KY, MD, ME, MI, MN, MO, NB, NC, NJ, NM, NY, OH, PA, SC, SD, TN, WA(3), WI	AL, CO, CT(2), DE, GA, HI, IA(2), IL(2), IN, KS, KY, MA, MN, MS, MT, ND, NH, NJ, NS, NY, OK, OR, RI, TX, UT, VI, VT, WA, WV, WY	blank	blank	blank	DC, LA, NE, NV, WI	AK, OK, WY	blank

Thus, our CSUS questionnaire produced no documented cases of ferrets killing or harassing livestock, although almost half of the 50 States reported a data deficiency. Eight States gave undocumented estimates of negative interactions with livestock in the range of 0 to 10 instances per year. No responding State agricultural department, including California's, indicated any serious concern about ferrets impacting agricultural resources in their State.

9.2. OTHER AGRICULTURAL ISSUES

Escaped, stray, or feral ferrets have the potential to vector diseases to livestock. In particular, ferrets may serve as a reservoir, or vector, of *Mycobacterium bovis*, the bacterium which causes tuberculosis in cattle:

> "After the Australian brushtail possum *Trichosurus vuplecula* Kerr, ferrets are regarded as the species most likely to threaten New Zealand's international beef, dairy and venison industries because they carry bovine tuberculosis (TB) and transmit the disease to livestock." (pp. 67-68, Byrom 2002)

> "Bovine tuberculosis is one of the more important animal health problems in New Zealand....The failure to eradicate bovine tuberculosis is due to the continual spread of *Mycobacterium bovis* from wildlife to cattle and farmed deer. Although the Australian brushtail possum *Trichosurus vulpecula* is the most important wildlife reservoir of infection in New Zealand, *M. bovis* has also been isolated from wild deer, feral pigs, feral goats, feral cats and feral cattle. In this letter we wish to report the finding of *M. bovis*-infected wild ferrets (*Mustela putorius furo*) in seven geographically distinct areas of New Zealand (Figure 1). While there are reports from overseas of *M. bovis* being isolated from domesticated ferrets, there are no reports of its isolation from wild ferrets or polecats (*Mustela putorius*)....These observations indicate that like the possum, ferrets are very susceptible to infection

with *M. bovis*...Current investigations in the macKenzie Basin and elsewhere are trying to determine whether tuberculous ferrets are a source of infection for domestic livestock. Even if there is no spread of infection to other hosts, ferrets may be a readily accessible indicator species to examine when looking for wildlife reservoirs of *M. bovis* in New Zealand." (pp. 148-149, deLisle *et al.* 1993)

"Ferrets pose a threat to New Zealand's agricultural industry, since our trading partners demand that we take steps to control potential transmitters of Tb to cattle and deer...However, as cattle and deer show little exploratory behaviour towards ferrets, it is unlikely that direct transmission from ferrets is a major source of Tb-infection of livestock." (p. 195, Clapperton 2001).

Some authors consider the ferret to be a threat to agricultural interests:

"It can be seen that European ferrets are established in climates much more severe than most of California with the exception of some dessert and high mountain areas. California's poultry and game bird producing areas could be readily colonized by the European ferret. As Eldridge Hunt (1986) states: 'We don't need 210 years of bounty system like Great Britain to drain government dollars to try to control ferrets. We need to prevent their establishment.' " (p. 211, Hitchcock 1994)

Clapperton (2001) states that one of the reason feral ferret populations are controlled in New Zealand is for "*...duckshooters and poultry keepers kéen to protect their local duck populations or hens.*" (p. 196, Clapperton 2001).

Clapperton (2001) discusses potential beneficial impacts of feral ferrets upon wildlife and agricultural interest; the exact wording is as follows:

"Benefits. While ferrets may not be keeping rabbits in check in the semi-arid tussock lands of Central Ontago, they do have some effect on rabbits elsewhere. Predation by ferrets is a major cause of mortality of juvenile rabbits on improved pasture in North Cantebury (Robson 1993). Pierce (1987) concluded that predators (ferrets, cats and harriers) exerted a high predation pressure on the surviving rabbits for up to six months after poisoning had reduce d the rabbit population along the Tekapo River. In that habitat they may play another useful role, outcompeting stoats, and thus reducing predation by stoats on riverbirds (Pierce 1987), but this has not been verified." (p. 194, Clapperton 2001).

Similar to cats, ferrets may be effective in controlling rats and other pest populations in urban or suburban environments.

9.3. SUMMARY AND OPINION

The literature documents that ferrets may have impacted European poultry production, especially in the late 19th and early 20th century. The literature is largely devoid of any instances of ferrets impacting agricultural resources in the USA. USA has, for the most part, phased out household poultry and egg production and now relies almost exclusively on commercial facilities (confined animal feeding operations); these facilities may be better protected from predators than traditional domestic hen houses and coops. Questionnaires of agricultural departments in the USA has not revealed any major opposition to ferrets; where agricultural agency personnel have responded negatively to ferret legalization, their concerns focused on the risk of ferrets biting humans or on the risk of ferrets establishing feral breeding populations, and not on the impact of agricultural resources. This issue may not need to be analyzed further in the EIR.

10. ANALYSIS OF POTENTIAL HUMAN HEALTH AND SAFETY ISSUES

10.1. RABIES (*LYSSAVIRUS*) TRANSMISSION

10.1.3. Reports from the Literature

The medical community, via its publications, has changed its stance on rabies issues pertaining to ferrets over the last four decades, beginning in the 1970s and 1980s with emphatic statements that ferrets are not appropriate pets because of their proclivity to bite and the absence of effective vaccines, to cautionary statements that ferrets may be suitable pets in the 1990s, to neutral statements in the 2000s that ferrets should receive rabies vaccinations like other household pets.

Up to 1988, there was no rabies vaccination that was proven effective for ferrets and no standard quarantine procedures due to a lack of data on the pathogenesis of rabies in ferrets (Paisley and Lauer 1988). Because of this, Paisley and Lauer (1988) recommended that "*...killing the ferret and examining the brain for rabies virus antigen is recommended after any human ferret bite.*" Paisley and Lauer (1988) also recommended, "*Until an effective rabies vaccine is available and more data regarding ferret bites are collected, we believe that health professionals should support legislation restricting the sale of pet ferrets.*" Constantine and Kizer (1988) published a similar opinion. As late as 1995, data on the pathogenesis of rabies in ferrets was still lacking. Hitchcock (1994) admitted that an effective rabies vaccine exists for ferrets, but recommended euthanization and immediate brain dissection because of uncertainty in rabies pathogenesis in ferrets. The National Association of State Public Health Veterinarians apparently issued an advisory *Statement on Ferrets* that expressed its concerns about the suitability of this animal as a pet, among other reasons, because there was, "*...inadequate information on the pathogenesis of rabies in ferrets.*" (Dodter 1995); euthanasia and immediate brain dissection was still recommended for ferrets that bit humans.

The attitude towards ferrets changed in the 1990s, as demonstrated by this excerpt from the Centers for Disease Control and Prevention:

> "The European ferret (*Mustela putorius*) has grown in popularity as a companion animal, but little is known about how the virus causes disease in this species. Although national ferret societies report annual sales exceeding 50,000 animals and more than one million are maintained as pets in the United States, rabies is rarely reported in ferrets. Since 1958, only 21 rabid ferrets have been documented by CDC through national surveillance activities. An important and often-asked question is whether ferrets, which are known to have bitten small children, make appropriate domestic pets. This issue should be considered separately from concern over the animal's potential role in rabies transmission. However, once the issue of rabies was raised in the debate over ferret ownership, a number of studies were designed to investigate the pathogenesis of rabies in ferrets to provide scientific guidelines in the event of ferret bite. While such information is available for cats and dogs, the virus shedding period of an infected ferret is unknown. Hence, ferrets that bite are frequently euthanized rather than quarantined, even if the ferret has been vaccinated. In a preliminary study designed to investigate the transmission and clinical course of rabies--a study that can be followed as an example in other species--ferrets were inoculated with street rabies virus of skunk origin. Susceptibility was shown to be directly related to the inoculation dose of rabies virus, and the incubation period was found to be inversely related to dose. Incubation periods ranged from two weeks to more than three months. The typical clinical presentation included paresthesia, fever, hyperactivity, weight loss, ataxia, and ascending paralysis. Morbidity periods were approximately four to five days. Rabies antigen was detected upon examination of brain tissue of 33 clinically rabid ferrets by immunofluorescent microscopy; 16 ferrets remained clinically normal and were negative for rabies antigen at necropsy. Rabies virus was not isolated from any oral swabs, but was recovered from a salivary gland collected at necropsy from one rabid ferret. The proportion of ferrets that developed rabies virus neutralizing antibodies (VNA) was directly related to the inoculum dose and usually appeared concomitantly with clinical signs. One ferret that presented with clinical signs of rabies seroconverted and eventually recovered but with severe paralytic sequelae; VNA were detected in the cerebrospinal fluid. These preliminary data are based on a single rabies variant of skunk origin but are in agreement with a prior investigation utilizing a European red fox rabies variant. These studies suggest that ferrets are not idiosyncratic in their response to rabies infection and that quarantine and observation periods may be reasonable to consider as additional data become available. Several states have already initiated quarantines for ferrets. Clearly, the pathogenesis of rabies, including viral excretion, may vary depending upon the dose, the route, and the strain of virus. While the likelihood of rabies in ferrets may be low, caution is warranted." (p. 403, Rupprecht *et al.* 1996)

The Centers for Disease Control and Prevention biologists from the Rabies Section (Rupprecht *et al.* 1996) report only 20 documented rabid ferret cases from 1958 to 1996. An excerpt is provided:

> "Although national ferret societies report more than one million ferrets maintained as pets, only 20 rabid ferrets have been documented since 1958." (p. 402, Rupprecht *et al.* 1996)

California Department of Health Services staff documented one case of a ferret contracting rabies in California:

"Twelve cases of ferret rabies have been documented in the United States, six of them since 1985 (Table 7). It is either known or reasonably assumed that essentially all of these ferrets had been bitten by rabid wild animals...In two incidents, one of which was in California, escaped ferrets developed rabies shortly after they were recaptured. Rabies-infected ferrets also have been purchased in pet shops." (pp. 13-14, Constantine and Kizer 1988).

"At least five pet ferrets have developed rabies in the United States, including an illegal escapee that was trapped in California in 1985." (p. 18, Constantine 1986).

The Centers for Disease Control and Prevention biologists from the Rabies Section (Rupprecht and colleagues) state that currently, at least in the USA, rabies is a rare disease and is relegated largely to non-pet vectors:

"Over the last 100 years, rabies in the United States has changed dramatically. More than 90% of all animal rabies cases reported annually to the CDC now occur in wildlife, whereas before 1960 the majority were in domestic animals. The principal rabies hosts today are wild carnivores and bats infected with several viral variants. Annual human deaths have fallen from more than a hundred at the turn of the century to one to two per year despite major outbreaks of animal rabies in several geographic areas. Modem day prophylaxis has proven nearly 100% successful; most human fatalities now occur in people who fail to seek medical treatment, usually because they do not recognize a risk in the animal contact leading to the infection. Although these human rabies deaths are rare, the estimated public health costs associated with disease detection, prevention, and control have risen, exceeding millions of dollars each year. Cost considerations must be weighed along with other factors in addressing issues such as the appropriate handling of nontraditional and exotic pets, future guidelines for rabies prophylaxis, and novel methods of disease prevention." (p. 400, Rupprecht *et al.* 1996)

"Human rabies is uncommon in developed nations. In the United States, scores of deaths from rabies were documented annually in the early 20th century. Now, fewer than three deaths are reported each year, most without a documented exposure. Still, this zoonosis exerts a disproportionate influence on health resources because of the necessity for prophylactic measures, including the administration of biological agents. Continued apprehension is rooted in ancient superstitions, the dramatic manifestation of hydrophobia, and the extreme case fatality ratio. Cases of the disease are preventable, but enzootic foci are plentiful and not eliminated easily. The public may not appreciate that their surroundings are a veritable sea of rabies, maintained by common animals. Globally, dogs are the major reservoirs. Bites from rabid dogs cause tens of thousands of deaths per year and prompt prophylactic treatment in millions of persons. Recent assessments illustrate that the magnitude of rabies in developing countries is grossly underestimated. Exposures may occur as single events, or one rabid animal may expose multiple people. In the United States, 15,000 to 40,000 people receive prophylaxis annually. Prophylaxis is effective and safe, but it is expensive and is often used inappropriately." (p. 2626, Rupprecht and Gibbons 2004)

"In North America, raccoons, skunks, bats, and foxes are the primary reservoirs responsible for transmission [of rabies]...Rabies in small mammals (such as mice and squirrels) is rare, and transmission from them to humans remains undocumented." (p. 2627, Rupprecht and Gibbons 2004)

The Rabies Branch of the Centers for Disease Control and Prevention publishes an annual report of their surveillance of rabies cases in USA and Puerto Rico. Summaries for the last decade are as follows:

2002: 7.967 animal cases (1 case in a ferret), 3 human cases (from bats) (Krebs *et al.* 2003)
2003: 7,170 animal cases (1 case in a ferret), 3 human cases s (Krebs *et al.* 2004)
2004: 6,836 animal cases (0 cases in ferrets), 8 human cases (none involving ferrets) (Krebs *et al.* 2005)
2005: 6,417 animal cases (0 cases in ferrets), 1 human cases (unknown source) (Blanton *et al.* 2006)
2006: 6,940 animal cases (3 cases in ferrets), 3 human cases (from bats, dog) (Blanton *et al.* 2007)
2007: 7,258 animal cases (0 cases in ferrets), 1 human cases (probably from bat) (Blanton *et al.* 2008)
2008: 6,841 animal cases (0 cases in ferrets), 2 human cases (both from bats) (Blanton *et al.* 2009)

The Centers for Disease Control and Prevention biologists from the Rabies Section states the following currently accepted protocol for ferrets:

> "According to experimental data and epidemiologic observations, some domestic species may be observed for signs of rabies. A healthy dog, cat, or ferret that exposes a person may be observed for 10 days. If the animal remains healthy, the patient does not need prophylaxis; only wound care is needed. If the animal sickens with signs compatible with rabies, it should be euthanized and the brain should immediately examined. If infection is confirmed within 24 to 48 hours after the animal is euthanized, there is adequate time to begin prophylaxis. After exposure to wildlife in which rabies is suspected, prophylaxis is warranted in most circumstances. Vaccination is discontinued if tests of the animal's brain tissue are negative for infection." (p. 2628, Rupprecht and Gibbons 2004)

Some veterinarians disagree with the Centers for Disease Control. Nagami (2004) is an example, who states:

> "Unlike dogs and cats, which show symptoms of rabies within ten days of infection, ferrets and skunks may harbor the virus without symptoms for several weeks. A ten-day quarantine, as for dogs and cats, will not detect all rabid ferrets, and rabies vaccination of a bitten person may thus be dangerously delayed. Many authorities recommend that any ferret biting a human should be humanely killed and its brain examined for rabies." (p. 223, Nagami 2004).

Veterinarian R. Ball describes a current vaccine product:

> "Rabies is rare in ferrets, but, as with all mammals, the potential for disease is real. A killed vaccine, IMRAB 3 (Merial, Inc.), is approved for use in ferrets." (p. 40, Ball 2002)

The California Department of Food and Agriculture apparently approved the use of IMRAB rabies vaccine designed for ferrets in 1990 (letter dated February 6, 1990, Dr. L.C. Vanderwagen, Chief, Animal Health Branc, CA Dept. of Food and Agriculture). Most pro-ferret organizations apparently encourage pet owners to vaccinate their ferrets for rabies (e.g., American Ferret Association [2006]).

The National Association of State Public Health Veterinarians, Inc. (2008) recommends in their *Compendium of Animal Rabies Prevention and Control*:

> "Domestic Animals. Local governments should initiate and maintain effective programs to ensure vaccination of all dogs, cats, and ferrets and to remove strays and unwanted animals. Such procedures in the United States have reduced laboratory-confirmed cases of rabies in dogs from 6,949 in 1947 to 71 in 2006 (2). Because more rabies cases are reported annually involving cats (247 in 2006) than dogs, vaccination of cats should be required (2). Animal shelters and animal-control authorities should establish policies to ensure that adopted animals are vaccinated against rabies. The recommended vaccination procedures and the licensed animal vaccines are specified in Parts II and III of this compendium, respectively." (p. 1, National Association of State Public Health Veterinarians, Inc.)

The American Ferret Association, Inc. (2006) recommends vaccinating ferrets with USDA licensed vaccine products labeled for use in ferrets for both canine distemper and rabies.

Phillips and Shimbo (1990) claim that the ferret rabies scare was manufactured by anti-ferret organizations.

10.1.4. Reports from Agencies

Numerous States and Provinces responded to the CSUS questionnaire regarding rabies cases involving ferrets, and if any of those cases resulted in transmission of the virus to humans. The majority of respondents indicated that there were no cases in their State or that such data did not exist. The following table summarizes the results.

Are there instances of domesticated ferrets contracting rabies (*Lyssavirus*) in your State?							
	No	Don't know	1	1 to 10	10 to 100	Estimate 0 – 1/yr	Estimate 1 – 10/yr
Response of States & Provinces	AL, AZ(2), CO, DC, DE, GA, IA, ID, IL, KS, MA, ME, MN(2), MO, MT, NB, NS, NY, OH, OR, RI, UT, VI, VT, WA, WA, WI, WV, WY	BC, CA, DE, HI, IN, KY(2), MN, NE, NH, NJ, NM, NV, NY, OK, OK, PA, SC, TN, WA, WA, WI, WY	AR, CT(2), MI	ND, NJ	blank	AK, IA, SD	blank

In his questionnaire responses, Raymond Conners (Connecticut Department of Agriculture Animal Control Division) reported 1 case of a rabid ferret transmitting the virus to a human (but no additional info was given). The questionnaire response is copied verbatim:

"There are 1 instances over the time period of record keeping. Records have been kept since year: 1991.
If yes, please indicate how many of these instances resulted in ferrets transmitting the rabies virus to humans: 1."

In her questionnaire responses, Dr. Michele Finateri (Michigan Department of Agriculture, Animal Industry Division) reported 1 rabid ferret case. The questionnaire response is copied verbatim:

"There are 1 instances over the time period of record keeping. Records have been kept since year: 1978.
If yes, please indicate how many of these instances resulted in ferrets transmitting the rabies virus to humans: 0."

In her questionnaire responses, biologist Linda DiPiano (New Jersey Department of Environmental Protection, Division of Fish and Wildlife) reported 3 rabid ferret cases. The questionnaire response is copied verbatim:

"There are 3 instances per year. "Since raccoon variant entered the state in 1989 (3 cases/20 yr).
If yes, please indicate how many of these instances resulted in ferrets transmitting the rabies virus to humans: 0."

In her questionnaire responses, Dr. Susan Weinstein (Arkansas Department of Health) reported 1 rabid ferret case. The questionnaire response is copied verbatim:

"There are 1 instances over the time period of record keeping. Records have been kept since year: way back but electronic records from 1990 on; one instance was June 1996: AR Dept Health records, Lab# L-239; I have fairly complete information concerning this one case.
If yes, please indicate how many of these instances resulted in ferrets transmitting the rabies virus to humans: 0."

California Department of Health Services did not respond to the CSUS questionnaire.

10.1.5. Summary and Opinion

Nothing in this report should not be construed as medical advice.

The medical community and various State agencies have reversed their stance on rabies issues pertaining to ferrets, from emphatic statements in the 20th century that ferrets are not appropriate pets because of their proclivity to bite and the absence of effective vaccines, to neutral statements in the 21st century that ferrets should receive rabies vaccinations like other household pets. The Centers for Disease Control and Prevention state that currently, at least in the USA, rabies is a rare disease and is relegated largely to non-pet vectors.

The vaccination of ferrets for rabies (and distemper) could be made mandatory, regardless of whether ferret ownership is legal or illegal in California. Ferrets sold after about 12 weeks of age should be vaccinated before sale. For those sold before 12 weeks of age, the new owner could be required to show proof of rabies vaccination by a certain time, such as 13 weeks of age. Every effort should be made to prevent ferrets from escaping confinement; any stray or feral ferret captured could be mandatorily held in quarantine until it is indicated that they are free of rabies. Public education and outreach should also be implemented. Provided that effective mitigation measures are incorporated into a legalization action, this

potential impact upon human health could be reduced to a less-than significant level. This issue may not need to be analyzed further in the EIR.

10.2. AGGRESSION TOWARDS HUMANS

10.2.1. Reports of Aggression from the Literature

Numerous literature sources suggest that the ferret can function as a docile household pet. The modern ferret has apparently been selectively bred for docility. Statements from Marshall Farms Group, Ltd. are reproduced here:

> "Marshall Farms Group Ltd has been raising domestic ferrets (*Mustela putorius furo*) for over 70 years. Besides being a popular household pet, the ferret is also an important animal model in biomedical research. Marshall's has been a pioneer in many aspects of ferret health care, husbandry, and reproduction. Years of careful breeding within a large, outbred colony has consistently resulted in healthy, friendly, and well-adapted ferrets." (Marshall Farms Group, Ltd., pers. comm. 2009)

> "Marshall Farms has decades of experience in the development and implementation of breeding programs for multiple species of domestic animals, including ferrets. A large, proprietary software database serves to archive and retrieve literally thousands of biologically relevant traits that are available to describe and profile each individual animal. These traits include phenotype, such as conformation, coat color, and any anatomical flaws, such as crooked teeth. Another category of traits represent qualities of individual temperament. Reproductive traits are also evaluated, including litter health and mothering abilities. Pedigrees are maintained and statistical assessment of trait characteristics allow for effective emphasis on desirable qualities, as well as attenuation or elimination of undesirable qualities. In general, the primary areas of emphasis for the breeding program include friendly, docile temperament; lack of physical or physiological abnormalities; and excellent overall health. These areas of emphasis serve to produce a ferret that is a gentle, well-adjusted pet, as well as an adaptable, healthy model in the biomedical research environment. To that end, the Marshall ferret has undoubtedly evolved not only from its original wild polecat ancestors, but also from its domesticated ancestors as well. Because this highly successful approach to breeding and raising ferrets is proprietary, information relative to the animal genetic database is largely unpublished." (Marshall Farms Group, Ltd., pers. comm. 2009)

Regardless of selective breeding, the ferret still has a propensity to bite (Boyce *et al.* 2001), and has been nicknamed "*ankle nipper*" (Jeans 1994). The pet manual *Ferrets for Dummies* explains that bites may be motivated by emotions such as those involved in play, quick movements, loud sounds, fear, or alarming or new situations, hunger or protection of food, or xenophobia. The following are excerpts that describe problem biting behavior:

> "Understanding your Dracula in fuzzy's clothing. Once in a blue moon, a person will adopt a ferret that's just plain mean—in other words, she's a biter—and nothing much can be done about it...Ferrets can bite for many reasons...Humans are the root of most biting evils...Not all ferret bites should be considered attacks. In fact, most aren't. Ferrets often have a good reason to bite; biting is sometimes the only way a ferret can communicate her needs or wishes...You must recognize the difference between playful biting and aggressive biting and try to correct both. An aggressive biter may bite you and hold on, or she may bite so hard that she draws blood. The pain caused by an aggressive biter is unmistakable. Playful bits include mouthing, light nips, and even 'nip and runs.' Although playful bits cause little to no discomfort, they may cause future problems." (pp. 319-320, Schilling 2007).

> "Among the other surprises in store for new ferret owners...is a tendency to bite hard if hungry or upset." (p. 59, Williams 1984).

> "Ferrets can bite but usually only nip in play. When a ferret bites the teeth sink in and the jaw locks. This hurts and is as painful as a kick by a horse." (p.3, Lewington 1988)

Ferrets for Dummies also provides suggested remedies for getting an aggressive ferret to release its locked jaws upon a human, and these remedies include distraction with bait, inserting a distasteful compound into the mouth, squeezing the