Forest County Potawatomi Community
Beaver (*Castor canadensis*) Management Plan

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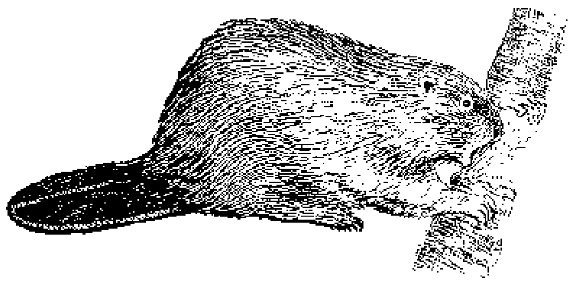

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1. PURPOSE

The purpose of this management plan is to guide beaver management on Forest County Potawatomi Community reservation and fee lands to sustain healthy beaver populations as well as improve and maintain habitat for an array of other wild species.

2. PLAN GOAL

Maintain healthy, functional beaver populations in ecological balance with available habitat, human needs, and associated species.

3. PLAN FACILITATORS

This plan was developed and will be implemented by FCPC's Natural Resources Department, specifically the Wildlife and Water Resources Programs. Specific actions in this plan may be carried out in part by or in collaboration with United States Department of Agriculture Wildlife Services (USDA – WS).

4. BACKGROUND

4.1 Natural History

Beavers are the largest of the rodents in all of North America. Most adults weigh between 16-31.5 kg (35-70 lbs) and attain a total length of up to 120 cm (~4 ft). Beavers are monogamous and begin producing young around 2 years of age (Gunson 1970). Beaver typically breed in the winter and give birth in late spring, producing only 1 litter per year (Baker and Hill 2003). Litter size of beaver is typically 2-4 young, who typically spend their lives with their parental colony in extended family units (Baker and Hill 2003).

Beaver have the ability to alter existing habitats to meet their needs which has resulted in beaver successfully colonizing a wide array of habitat types. Beaver do however rely on forested areas for the building and constructing of their dams and lodges. Beaver use a multitude of woody vegetation and other materials to construct dams and lodges (Figure 1) including conifer and deciduous trees, aquatic plants, cornstalks, plastic, metal or other debris (Baker and Hill 2003). Interestingly, when preferred foods are limited and less-preferred foods are more abundant, beaver will utilize less-palatable stems for dams and save the more palatable stems for food (Barnes and Mallik 1996).

Beaver are generalist herbivores, consuming a diet of herbaceous and woody plants, which varies considerably by region and season. In a study out of Canada, beaver diet was made up of willow (76%), poplar (14%), and alder (10%), though when available aspen is usually more preferred than willow (Alksiuk 1970; Jenkins 1981). Beaver eat the leaves, buds, roots, and fruits of deciduous woody debris, and acorns when available (Grinnel et al. 1937, Novak 1987). Beaver typically eat only the bark of coniferous vegetation.

Figure 1. Large beaver dam on Forest County Potawatomi reservation land, summer 2009.

4.2 Distribution and Abundance

Prior to European settlement, there was an estimated 60-400 million beavers in North America (Seton 1929). Despite this legendary abundance, most beaver populations were decimated during the 1700-1800s, primarily due to the fur trade for fashion hats (Bryce 1904). Loss of habitat was also a contribution to the decline of beavers, with 195,000-260,000 km^2 of wetlands in the United States drained for agriculture (Naiman et al. 1988). Beaver populations in the eastern United States were largely extirpated by fur trapping before 1900.

Figure 2. Current distribution of beavers in North America. From Feldhamer et al. 2003.

Growing public concern and management and reintroduction efforts have allowed beavers to make a remarkable return, with beaver populations estimated at 6-12 million in North America by 1988 (Naiman et al. 1988). This period was also when beavers in Wisconsin were at their greatest recent-history population levels, with 1992 Wisconsin beaver population estimated at 108,130 (BWM, *unpublished document*). After this resurgence of the population, Wisconsin state officials increased the annual harvest limit and control measures of beavers in particular zones (see Figure 3) in order to improve trout stream habitat and decrease damage complaints.

Current beaver abundance varies throughout the state. The Wisconsin Department of Natural Resources (WDNR) divides the state into different zones of abundance and for beaver population management. One goal of "zoning" is to reduce or maintain low beaver populations in zones where they are in greatest conflict with human interests. A second goal is to allow and encourage populations where there is greater tolerance and benefits associated with these animals. Population estimates for northern Wisconsin (Zones A and B) are summarized in Table 1.

Table 1. WDNR beaver population estimates for northern Wisconsin, 1992-2001 and 2008 (BWM, *unpublished document*).

Zone	1992	1995	1998	2001	2008
A	40,300	51,800	45,000	38,900	27,800
B	40,800	43,100	22,900	20,800	17,500

4.3 Wisconsin Beaver Management Zones

A High beaver population and excellent beaver habitat. Relatively few people-and-beaver conflicts occur. Stable beaver population is desired.

B High beaver population, excellent beaver habitat and excellent trout habitat. Trout stream protection takes precedent over protection of beaver on high quality trout streams. Reduced beaver population has occurred. Maintenance of a stable beaver population is desired.

C Moderate to low beaver population; habitat is considered average. Few people-and-beaver conflicts occur. Stable beaver population is desired.

Figure 3. WDNR beaver management zones (WDNR, unpublished document).

D Low beaver population. Beaver population increase is desired to provide more waterfowl habitat.

4.4 Cultural Significance of Beaver

To many Native American cultures, the beaver is an innovative builder; an inspiration of wisdom and resourcefulness. In Algonquin society (including the Potawatomi), the beaver is the Spirit Keeper of the East whose wisdom helps man master his relationship with the environment. In the Aanishnaabe culture of the Great Lakes, the beaver taught man many things, from lessons in parenting to showing man how to work together for the greater good of the community (Dunn 1995). Beavers are valued for their intelligence, innovation, and strong spiritual ties. The beaver also historically represented a great source of trade revenue for the Potawatomi, often trading furs to the French for luxuries such as kettles, clothing, guns, and gunpowder (Mitchell 1997, FCPC 2008).

5. EFFECTS OF BEAVER ON LOCAL ECOSYSTEMS

5.1 Beaver as Ecosystem Engineers

Beaver represent a keystone species that greatly influences the species composition and physical appearance of ecosystems. The dam-building, canal-building, and foraging activities of beaver have a profound effect on ecosystem structure and function (Baker and Hill 2003). This is particularly evident in its effects on fish populations, and can be positive or negative (further detail below).

Beaver can also play a role in affecting other wildlife. Beaver ponds are an important habitat for moose because they increase production of woody plants and aquatic vegetation. In some cases, however, moose may compete with beaver for limited food supplies (Baker and Hill 2003). Waterfowl also use beaver ponds for nesting and brood-rearing habitat and as stopover sites during migration (McCall et al. 1996).

Wetlands created by beaver can enhance biodiversity by providing important habitat for fish (Snodgrass and Meffe 1998, Schlosser and Kallemyn 2000), waterfowl (Brown et al. 1996, Russell et al. 1998) and herps (Russel et al. 1998, Stevens et al. 2007). In areas where bog environments have been created by beaver dams, a rich diversity of wetland-related reeds, trees, and wildflowers are supported. Several studies have documented an increase in bird species richness, diversity and abundance (Krueger 1985, Medin and Clary 1990, Grover and Bladassarre 1995) in beaver pond habitats.

5.2 Beavers and Climate Change

Beavers have the potential to help offset the effects of climate change on a local ecosystem. Climate models predict the incidence of drought in some regions, including boreal North America, will increase in frequency and duration over the next 100 years (Moore et al. 1997, Hengeveld 2000, Hogg and Bernier 2005, Schindler and Donahue 2006). Additionally, intensified industrial, agricultural, and urban demands make concerns of warming even more relevant to trends in wetland loss (Moore et al. 1997). Loss of wetlands will not only result in a net loss of water available for anthropogenic usage, but Johnson et al. (2005) also found that drought conditions displace waterfowl populations and lower overall waterfowl production. Loss of wetlands, which typically provide habitat for a large array of plant and animal species, will also undoubtedly lower the biodiversity of an area.

The role of beavers as a keystone species in creating and maintaining wetlands at landscape scales has been well documented (Naiman et al. 1998, Johnston and Naiman 1990a). Beavers are known to increase the area of open water wetlands in streams and riverine systems (Johnston and Naiman 1990b) and a study by Hood and Bayley (2008) suggest that activity by beaver can offset the effects of global climate change by maintaining areas of open water, even in drought years. Beaver dams, however, may exasperate the negative effects of climate change on cold water systems if dams cause downstream warming. For example, streams with water temperatures that support trout populations could experience temperature increases above the tolerance level for these fish in the presence of both beaver dams and climate change, adversely impacting the resident trout fishery. Thus, utilizing beaver dams as hydrologic control for open water or wetland maintenance should be evaluated on a site-specific basis, and cost-benefit options should be weighed whenever a net loss of wetlands occurs due to beaver removal. Minimizing the effects of climate change on natural resources will be a priority action of the natural resources department, therefore the positive effects of open water sources created by beavers should be considered during management decisions.

5.3 Beaver Damage

In areas where beavers and humans exist, property damage and "nuisance" issues will inevitably exist. Beaver damage can include flooding of roads by plugging culverts, damage to timber by flooding and cutting, and flooding of agricultural crops. Additionally, beavers can inhibit efforts for restoring and conserving trout populations by causing damage to natural and restored wild trout habitat (i.e. inundation and direct removal of tree-plantings installed for stream shading, and inundation and siltation of reconstructed channels with in-stream habitat structures), create physical barriers to spawning areas, increase sediment retention (Dickerson 1989), and prevent fish passage. Trapping and killing of unwanted beavers and the dismantling of lodges is the most common form of control. Live-trapping and relocating problem beaver is sometimes an option, however this method is expensive and is not possible if a suitable relocation site is not available. Moreover, beaver may suffer high mortality from trap and relocation stress and cause long-term undue suffering.

5.4 Effects of Beaver on Native Trout Populations and Habitat

The relation of beaver to trout is an interesting and complex problem in ecology and management of natural systems. Trout habitat in streams may be improved by beavers where low flows or cold water temperatures limit trout distribution or production. However, in areas of the eastern United States where trout populations are limited by high water temperatures, beaver ponds may increase stream temperatures beyond tolerable limits. Additionally, dams may prevent or restrict the passage of fish (Baker and Hill 2003). In such cases, beaver dams require removal to improve and conserve trout habitat and populations.

According to Pasko (1969), beaver dams on small trout streams usually produce effects which follow an explicit pattern of events. Initially, the vegetation flooded by a new pond will decay, fertilizing the water and increasing the food supply. The trout then grow rapidly, and the fishery may actually be improved for a period of 1-3 years. However, if the pond area is shallow and exposed to the sun, it becomes warmer than the stream thereby favoring a great increase in minnow abundance. The minnows then consume much of the available food, which results in a reduction of trout production. After a few years, the beaver pond may become quite shallow and warm because of silting, while decomposing organic deposits increase acidity of the water. Thus the pond and its outlet are likely to deteriorate in suitability for trout. Also, good spawning areas may be smothered by deposits of silt or shut off from trout further downstream, if the beaver dam forms a physical barrier to upstream migration.

6. FCPC MANAGEMENT ACTIVITIES

6.1 Monitoring and Population Projection Efforts

Beaver population numbers on the FCPC Reservation and surrounding areas will be monitored cooperatively with USDA Wildlife Services and US Forest Service through the use of fixed-wing aircraft flights for beaver lodges. USDA-WS conducts regular flights for control efforts, an activity which FCPC Wildlife or Water Resources Personnel may participate in. These flights can be coordinated to survey specific portions of stream that reside within or directly affect FCPC lands. US Forest Service conducts annual fall population estimate surveys within the Nicolet National Forest, data which will be provided to FCPC Wildlife personnel for the purpose of monitoring local beaver populations.

Through aerial surveys, active beaver lodges can be identified along sections of stream and used to estimate population. Active colonies are identified by the presence of fresh feed piles, cuttings, and/or evidence that the lodge has been recently maintained (Rolley et al. 2008). Observed colonies are then divided by an observation rate of 0.81 (Payne 1981, Kohn and Ashbrenner 1994, Rolley eta l. 2008) for an overall estimated number of colonies. The number of estimated colonies in the area is then multiplied by mean colony size of 5.5 beaver per colony (Peterson 1979, Kohn and Ashbrenner 1994) to estimate the overall beaver population within the area of interest.

Beaver population numbers will be monitored annually and control and management actions adapted accordingly to ensure continued populations of beavers within and surrounding FCPC land. This information will be available to Tribal members through periodic progress reports and quarterly reports.

6.2 Management and Damage Control

Due to the unpredictable nature of beaver and the possible effects of their dams on a site-specific basis, beaver dams will generally be handled on a case-by-case situation with priority for dam removal given to cold water trout streams and reaches where in-stream and riparian habitat (i.e. restored areas) require protection. Established dams that threaten sensitive natural resources (i.e. wild rice beds) or standing infrastructure will also be removed.

On FCPC lands some streams have been classified according to water temperature. Cold water streams are those with a maximum daily mean (MDM) temperature less than 71.6°F, cool water streams are those with a MDM between 71.6 and 75.2°F, and warm water stream have a MDM greater than 75.2°F. FCPC cold or cool water streams usually support a naturally reproducing population of brook trout and should be given management priority.

In Wisconsin, trout streams are divided into three classes for fish management purposes: Class I, II, and III. Class I streams are high quality trout waters, having sufficient natural reproduction to sustain populations of wild trout at or near carrying capacity. Class II streams may have some natural reproduction of trout, but stocking is often required to maintain a desirable sport fishery. Class III trout waters are marginal habitat with no natural reproduction occurring.
Stocking of Class III streams is required to provide trout fishing and there is no carry-over of trout from one year to the next (Kmiotek 1980). Table 2 lists FCPC streams and their temperature and trout classifications.

In some cases local resources and management objectives may complicate beaver removal prioritization. For example, Rat River is warm water stream and a class III trout fishery, yet it may require protection since it provides the best wild ricing opportunities on FCPC lands. Whereas Deer Creek is a cold water stream that does not support a trout fishery, it may require protection since a future access road and culvert will be installed near a past beaver dam; however, if a dam is determined a non-threat to infrastructure then removal may not be necessary. In some instances, beavers may affect baseline water quality monitoring locations and may require removal. Prioritization is complex at times, site-specific conditions and local management objectives will need to be incorporated into beaver management strategies and justification for beaver dam removal or maintenance.

Table 2. FCPC stream temperature classifications and Wisconsin trout stream classifications for streams where beaver damage management activities are likely to occur, temperature data 2006-2009 and trout stream classifications listed on the WDNR website).

Stream Name	**Temperature Classification**	**WI Trout Stream Classification**
Colburn Creek	cold	class II
Deer Creek*	cold	--
Johnson Creek	--	class I
Hemlock Creek	--	class II
Kufner Creek	cold	class II
Mexico Creek	cold	class II
Michigan Creek	--	class I
Middle Branch Peshtigo River	--	class III
Newman Creek	cold/cool	--
North Branch Oconto River	cool/cold	class II
Otter Creek (Headwaters)	cool	class II
Otter Creek (Middle)	warm	class II
Otter Creek (Big stone)	warm	class II
Pemma Creek	cold	class II
Swamp Creek	--	class II
Swan Creek**	cold	class II
Torpee Creek (Springs)	cold	class II
Torpee Creek (Highway 32)	warm	class II
Rat River	warm	class III

Temperature Classifications (based on maximum daily mean), Cold < 71.6°F; Cool 71.6 - 75.2°F; Warm > 75.2°F

The goal of any and all beaver damage management activities is to protect stream and riparian habitat by more effectively managing beavers residing on Tribal lands and to create a balanced environment where beaver, fishes, and other aquatic life can thrive. In some cases the Wisconsin trout classification may not accurately represent the trout fishery and it should be noted that neither the temperature nor trout classification should be used on its own to determine if beaver and dam removal is appropriate. Rather, consideration for management should be given to streams with a known ability to support natural trout reproduction, in combination with an evaluation of the surrounding resources and overall management objective for that particular area. Thus, a case-by-case approach is the most appropriate strategy for managing beaver on FCPC lands.

6.3 Beaver/Beaver Dam Removal

The purpose of removing beaver dams is to: 1) allow the natural movement of spawning trout; 2) avoid seasonal water temperature extremes; 3) prevent the deterioration of trout streams via bank sloughing, siltation of spawning areas, in-stream cover loss, and channel widening; and 4) prevent damage to standing infrastructure.

USDA - WS cooperates with the State of Wisconsin, US Forest Service, and Wisconsin tribes to control beavers in areas where trout management and stream restoration take precedent, such as in Forest County which lies in Zone B. USDA - WS beaver damage control protocols have undergone Environmental Assessments and follow NEPA regulations. FCPC Wildlife and Aquatic Resources personnel will work closely with USDA - WS for beaver/dam removal activities and closely follow similar protocols to reduce impact on the environment and overall beaver populations. Any beaver dams on FCPC reservation land designated for removal will be coordinated as a joint effort between USDA - WS and FCPC Water and Wildlife Resources personnel.

The standard method for beaver damage control is to lethally trap and remove beavers, followed by dismantling the dam by hand or using explosives if necessary. Beaver trapping is usually accomplished utilizing partially-submerged body gripping traps (conibear-style traps). Beaver trapping will be facilitated by USDA-WS and assisted by FCPC personnel.

6.4 Non-lethal Control Methods

Many wildlife control protocols include some use of non-lethal control before lethal removal takes place. Non-lethal methods of removal (i.e. life-trap and relocate) do exist, however survival rates of relocated animals is severely low and may cause long-term stress and suffering (R. Willging, USDA-APHIS, *pers. comm*.). Additionally, many areas of northern Wisconsin are undergoing beaver reduction plans and opportunities/locations for relocation are non-existent.

FCPC Natural Resources personnel will, however, continue to monitor beaver populations in and around Tribal lands and will adjust management activities accordingly. Should population numbers become adversely affected by lethal removal, non-lethal alternatives may again be explored.

6.5 Wilderness and Protected Areas

No beaver management activities shall occur in the Devil’s Lake Wilderness area (Figure 4). Outside of this area, in areas where it is found that beaver lodges are benefitting the local ecosystem, such as in providing waterfowl brooding areas or ponds that develop a unique fish or vegetation assemblage, beavers and associated lodges and dams will be left in place.

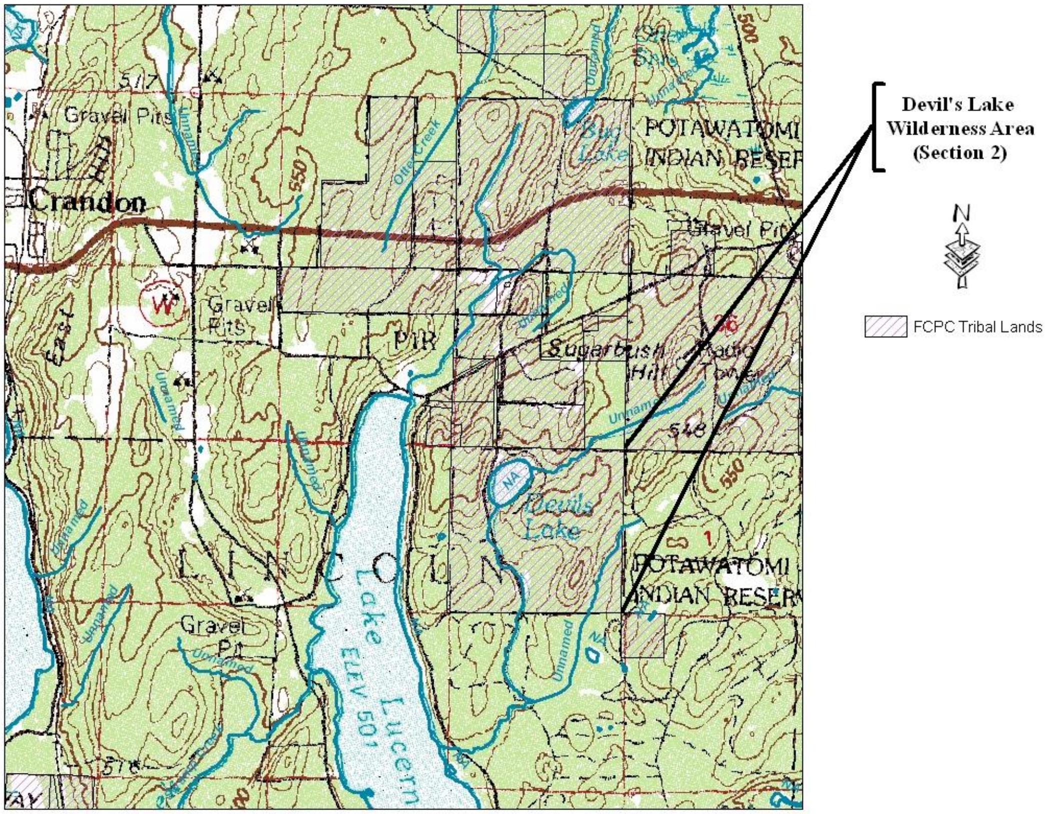

Figure 4. Devil's Lake Wilderness area (Section 2) on FCPC land where no beaver management activity will take place.

6.6 FCPC-USDA Inter-Governmental Relations on Beaver Management

Wildlife is a shared resource that crosses several jurisdictions. Management practices off reservation land may affect resources on reservation land, and vice versa. It is therefore imperative that agencies and stakeholders cooperate and coordinate efforts in order to ensure the wisest use of wildlife resources. FCPC Natural Resources personnel are working cooperatively with USDA - WS to manage and monitor beaver populations in and around reservation land. In 2010, a Memorandum of Understanding (MOU) was developed between these agencies with a goal of developing a system for coordinating sustainable beaver management that also protects water quality, sensitive stream and riparian habitat, and coldwater fisheries. The MOU includes an agreement to share data and cost for beaver management, and also provides a framework for respecting and including tribal spiritual requests and activities when conducting management activities. Furthermore, tribal members may be able to collect and utilize trapped beavers from management activities for personal use. The MOU also creates and understanding that USDA will work with FCPC on issues of beaver populations, and will modify management activities if monitoring data begins to indicate a detrimental decline to local populations. Among a partial list of the responsibilities listed in the MOU, USDA - WS agrees to:

1. Contact FCPC authorized representatives and obtain the Tribe's permission to conduct beaver damage management activities within the boundaries of FCPC lands prior to accessing FCPC lands and waters.
2. Implement beaver damage management activities on Tribal land in accordance with the FCPC's Beaver Management Plan (this document).
3. Provide the FCPC with the opportunity to have Tribal streams incorporated into USDA-WS fly-over surveys.
4. Provide the FCPC with resulting data from fly-over surveys as well as additional data pertaining to beaver and beaver dam removal services that takes place outside of Tribal lands, including FCPC target streams as well as those reaches of target streams that occur outside of Tribal boundaries.
5. Notify the FCPC of beaver dams that may be impounding water onto Tribal Lands and if needed, work with the Tribe to provide damage management services.
6. Relinquish trapped beaver to FCPC NRD staff and/or make arrangements for pick-up at an APHIS-WS location.
7. Implement an adequate draw down of water prior to dam removal in order to avoid catastrophic flooding and adverse impacts to aquatic life. Dam removal should occur at appropriate times to avoid impacts to nesting waterfowl and spawning fish.
8. Employ the most effective and humane means of beaver and beaver dam removal possible.
9. Accommodate the spiritual and cultural requests of the Tribe and Tribal members in regards to beaver removal.

7. WORK TO BE ACCOMPLISHED

Beaver Population Projections and Monitoring - FCPC personnel will create and maintain a database of beaver lodge locations and activity on FCPC land. Population estimates will be graphed and analyzed over several years to assess the impacts of beaver management in the area (Initial Population Assessment, Appendix I).

Brook Trout Population Monitoring and Habitat Protection - Brook trout populations will also be monitored to assess the effectiveness of beaver management on brook trout habitat.

Outreach - Interested tribal members will be provided with the most current data on beaver populations and FCPC personnel will address concerns by the membership through tangible action.

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Preliminary Beaver Population Analysis
2010

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Forest County Potawatomi Community Wildlife Resources Program Director

Background

As part of Forest County Potawatomi Community's (FCPC) Wildlife Resources Program, a management plan for North American beavers (*Castor canadensis*) was initiated in 2010 in relation to the Water Resources Program efforts for managing trout streams on FCPC waterways. The Beaver Management Plan explicitly identifies periodic population analyses of beaver in and around FCPC as a goal. This document provides the most current data as well as previous trend data (1987-2009) on beaver colony density (and resultant population density) as a baseline for future management. Data is provided by the U.S. Forest Service and USDA Wildlife Services, Rhinelander, Wisconsin offices.

History

In 1989 the Wisconsin State Legislature provided funds for the WDNR to determine the feasibility of significantly reducing beaver numbers in problem areas. Estimates of the beaver population in the northern third of Wisconsin indicate a decrease of 35% between 2005 and 2008 and more than 50% since 1995 (Rolley et al. 2008). Efforts to control beaver in trout management areas is still underway, thus continued decreases will likely be noted.

Methods

Aerial surveys are performed in the Nicolet National Forest annually by US Forest Service personnel, and surveys of FCPC land are conducted by USDA Wildlife Services. Both agencies then provide FCPC personnel with annual data. Active colonies are identified by USFS observers. Active colonies are identified by the presence of fresh feed piles, cuttings, and/or evidence of recent maintenance (Rolley et al. 2008).

A buffer surrounding FCPC land was created at a distance of 10 miles (Figure 1), assuming that beaver density within 10 miles of Tribal land will directly influence beaver density on FCPC land. Trends in beaver lodges and population estimates are then presented both on the scale of the 10-mile buffer as well as pertaining specifically to FCPC land.

The estimated number of active colonies within each block was calculated by dividing the number observed by an observation rate of 0.81 (Payne 1981, Kohn and Ashbrenner 1994). A mean colony size of 5.5 beaver per colony (Peterson 1979, Kohn and Ashbrenner 1994) was then used to estimate the beaver population.

Results

Beaver population trends on FCPC land and surrounding 10-mile area reflects the overall statewide trend of decrease since 1989. No beaver lodges were detected on FCPC land during 2009 surveys (Figure 2), however surveys of the surrounding 10-mile radius identified 28 active lodges, resulting in a population estimate of approximately 190 individuals (Figure 3). Results of 2010 surveys identified 5 lodges on FCPC land (approximately 34 individuals) and 58 lodges within the 10-mile buffer, with an estimated 394 individuals.

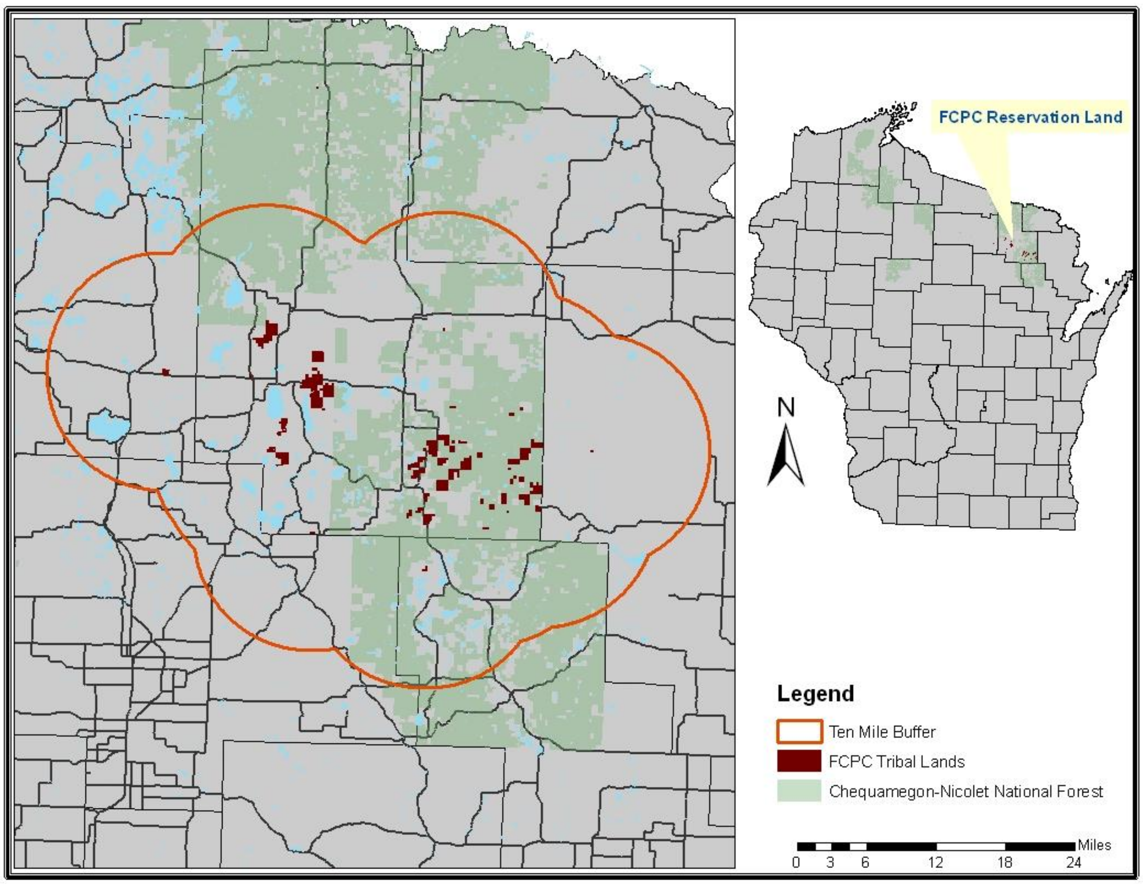

Figure 1. Ten mile beaver management buffer zone surrounding FCPC land.

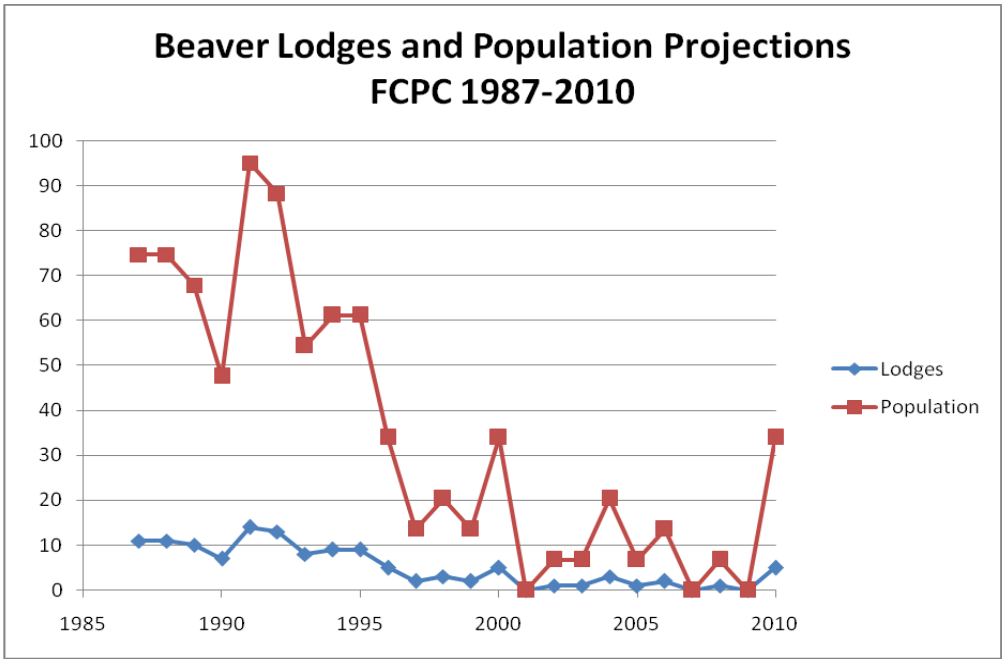

Figure 2. Observed beaver lodges within FCPC land utilizing aerial survey data provided by U.S. Forest Service and USDA Wildlife Services, Rhinelander, WI. Also represented are annual population estimates of beaver on FCPC land, 1987-2010, based on Peterson (1979), Payne (1981), and Kohn and Ashbrenner (1994).

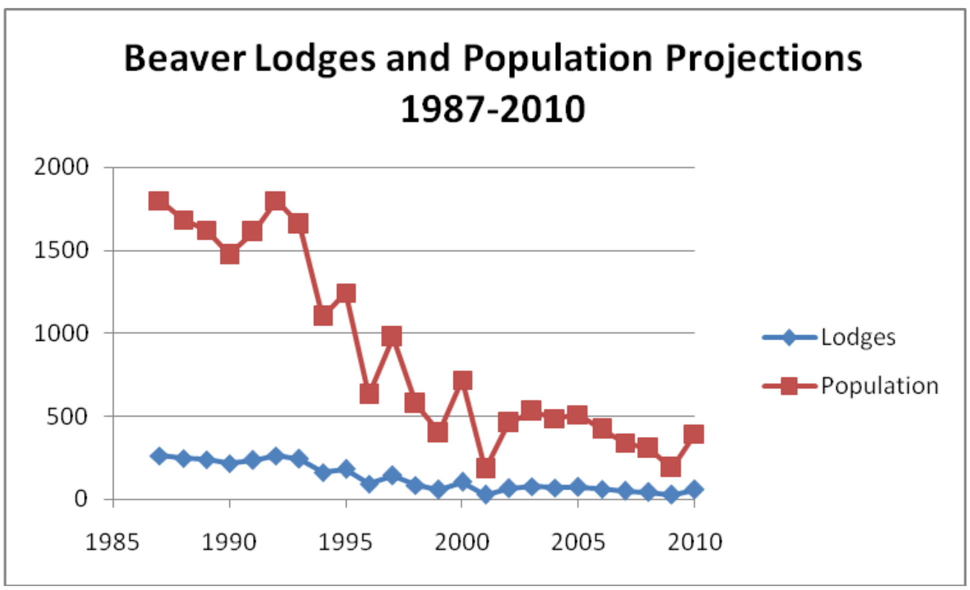

Figure 3. Aerial lodge survey (1987-2010) results within a 10-mile radius of FCPC land and associated annual population estimates. Data are provided by the U.S. Forest Service and USDA Wildlife Services offices, Rhinelander, WI.