Podsumowanie opinii sporządzonych przez zagranicznych ekspertów, wybitnych uczonych – ekologów i leśników, dla Kancelarii Prezesa Rady Ministrów Rzeczpospolitej Polskiej

Opinie o konflikcie środowiskowym wokół Puszczy Białowieskiej zostały opracowane oddzielnie przez:

1) **Prof. dr inż. Chrisa J. Cieszewskiego** (Warnell School of Forestry and Natural Resources, University of Georgia, USA); dyscyplina naukowa: modelowanie matematyczne stosowane w inżynierii leśnej;
2) **Prof. dr Klausa von Gadowa** (Georg-August-Universität Göttingen, Fakultät für Forstwissenschaften und Waldökologie Burckhardt-Institut, Germany); dyscyplina naukowa: inwentaryzacja lasu i teledetekcja;
3) **Prof. dr Johna A. Kershawa Jr.** (University of New Brunswick, Canada): dyscyplina naukowa: dendrometria;
4) **Dr Patricka Moore'a** (Vancouver, Kolumbia Brytyjska, Canada); dyscyplina naukowa: ekologia lasu; współzałożyciel i jeden z dyrektorów Greenpeace International.

W niniejszym podsumowaniu omówiono problemy oraz przedstawiono zalecenia związane z aktualnym konfliktem dotyczącym działań ochronnych i gospodarczych na terenie trzech nadleśnictw: Białowieża, Browsk, Hajnówka wchodzących w skład Leśnego Kompleksu Promocyjnego „Puszcza Białowieska" w Puszczy Białowieskiej. Wyżej wymienione opinie stanowią załącznik do niniejszego podsumowania.

Eksperci w większości sporządzili opinie m.in. na podstawie:

1) obserwacji dokonanych podczas wizyty odbywającej się w terenie,
2) dyskusji z polskimi naukowcami podczas wizyty w terenie i po jej zakończeniu,
3) rozmów z leśnikami z Puszczy Białowieskiej, przedstawicielami samorządu lokalnego i innymi grupami społecznymi,
4) literatury historycznej i współczesnej dotyczącej Puszczy Białowieskiej,
5) literatury z zakresu gospodarki leśnej, ochrony przyrody, ekologii, konfliktów ekologicznych i socjologii środowiska,
6) osobistego wieloletniego doświadczenia naukowego i zawodowego.

Rada Naukowa Leśnictwa przy Prezesie Rady Ministrów Rzeczpospolitej Polskiej po zapoznaniu się z opracowaniami autorów:

Cieszewski C. J. – "Situational Evaluation Report", prepared for the President of the Council of Ministers of the Republic of Poland, regarding the *Ips typographus* outbreak in spruce stands within the area of the forest districts: Białowieża, Browsk and Hajnówka included in the Promotional Forest Complex of "Puszcza Białowieska";

Gadow K. v. – "The Białowieża Conservation Conflict. Report to the Chancellery of the Prime Minister of Poland";

Kershaw J. A. Jr. – "Białowieża Primeval Forest: Management Action under Conflicting Ecological Paradigms. An Assessment Report of the Białowieża Study Tour August 1 – 4, 2016. Prepared for the Chancellery of the Prime Minister of Poland";

Moore P. – "Comments on the Management of the Białowieża Puszcza Forest Region in Poland",

stwierdza, że są one w znacznym stopniu zbieżne ze wcześniej opracowaną „Opinią Rady Naukowej Leśnictwa przy Prezesie Rady Ministrów Rzeczpospolitej Polskiej w sprawie zamierania drzewostanów świerkowych na obszarze Nadleśnictw: Białowieża, Browsk i Hajnówka wchodzących w skład Leśnego Kompleksu Promocyjnego „Puszcza Białowieska" z dnia 11 marca 2016 roku. Dotyczy to zarówno analizy zjawiska zamierania drzewostanów świerkowych na skutek gradacji kornika drukarza, jak i propozycji postępowania ochronnego i gospodarczego.

Eksperci w swoich opiniach zgodnie podkreślili:

- znaczenie historyczne, społeczne i przyrodnicze Puszczy Białowieskiej nie tylko dla Polski, ale i społeczności międzynarodowej oraz znacznego wpływu człowieka na kształt i stan jej ekosystemów leśnych,
- sprzeczność obowiązujących obecnie przepisów dotyczących Puszczy Białowieskiej wynikających z przyjętych ustaw i rozporządzeń krajowych jak i dyrektyw zewnętrznych (Natura 2000, UNESCO, itp.),
- konieczność odrzucenia zasady „nic nierobienia" w trzech nadleśnictwach Puszczy Białowieskiej i pozostawiania rozwiązania w nich problemów gradacji kornika drukarza tylko siłom przyrody,
- uznanie gradacji kornika drukarza w trzech nadleśnictwach jako istotnego zagrożenia dla ekosystemów Puszczy Białowieskiej, z czym wiąże się konieczność podjęcia czynnej walki z tym szkodnikiem,

- konieczność stałego prowadzenia (poza Białowieskim Parkiem Narodowym) w trzech nadleśnictwach racjonalnej gospodarki leśnej,
- konieczność podjęcia działań medialnych i upowszechniających wiedzę celem zwiększenia poziomu edukacji publicznej,
- konieczność podjęcia działań dla zapobieżenia przyszłym konfliktom na tym obszarze.

Poniżej przedstawiono najbardziej istotne tezy z poszczególnych opinii ekspertów.

Prof. Chris J. Cieszewski m. in. stwierdził, że:

1. Lasy poza obszarami ochrony ścisłej powinny podlegać gospodarce leśnej wedle najlepszych umiejętności zawodowych miejscowych leśników oraz zgodnie z najlepszymi praktykami leśnymi, aby ograniczyć trwającą gradację *Ips typographus*.
2. Obszar ochrony ścisłej nie powinien zostać rozszerzony na inne części regionu. Zaleca się, aby przed ewentualnym podjęciem takiej decyzji wyraźnie wskazać osoby, które zgadzają się zapłacić za tego typu eksperyment i wszystkie jego konsekwencje, w tym za szkody, jakie poniesie gospodarka, interesy mieszkańców i rynek nieruchomości.
3. W ramach trwającego sporu należy udostępnić opinii publicznej informacje na temat interesów finansowych wszystkich osób i instytucji w nim uczestniczących, a także zapewnić nieskrępowany dostęp do źródeł informacji o wszystkich przeszłych, obecnych i potencjalnych przyszłych zyskach finansowych (np. dotacjach i innych korzyściach materialnych) osób i instytucji biorących udział w publicznym sporze na temat Puszczy Białowieskiej, jej funkcji i gospodarowania nią.
4. Istnieją udokumentowane zapisy wykazujące, że Puszcza Białowieska była w przeszłości wycinana i że wiele drzew zostało nasadzonych. Oczywistym jest, że Puszcza Białowieska swój obecny kształt zawdzięcza przede wszystkim gospodarce leśnej prowadzonej przez człowieka. Zatem wiele argumentów przeciwko utrzymywaniu gospodarki leśnej w Puszczy Białowieskiej jest – ogólnie rzecz biorąc – bezpodstawnych, ponieważ cechy takie jak na przykład bogactwo gatunków czy różnorodność biologiczną można osiągnąć w znacznie większym stopniu w ramach gospodarki leśnej prowadzonej dla osiągnięcia tych cech niż wedle scenariusza ochrony polegającego na nierobieniu niczego, podobnie jak w przypadku ochrony ścisłej.
5. Obecnie najważniejszym problemem Puszczy Białowieskiej jest niekontrolowana gradacja *Ips typographus*, w wyniku której są zabijane świerki i inne gatunki drzew,

takie jak sosna. Gradacja ta stanowi wielkie niebezpieczeństwo dla całej Puszczy Białowieskiej. Liczebność populacji kornika drukarza *Ips typographus* gwałtownie zwiększyła się w 2012 roku, gdy zmniejszono arbitralnie rozmiar cięć sanitarnych. Od tej chwili również zwiększyła się liczba pokoleń tego owada w ciągu roku, obszar jego rozprzestrzeniania się oraz liczba zabitych drzew. Niebezpieczeństwo stworzone przez tę gradację wiąże się nie tylko z zabijaniem drzew i niekontrolowanym rozprzestrzenianiem się *Ips typographus*, lecz również ze stworzeniem złych warunków sanitarnych. Nie usunięte martwe drzewa stwarzają zagrożenie dla bezpieczeństwa publicznego oraz zwiększają niebezpieczeństwo pożarów. Jednocześnie przyczyniają się znacząco do uwalniania gazów cieplarnianych, takich jak CO_2, co niweluje pozytywną rolę lasów w sekwestracji dwutlenku węgla i produkcji tlenu.

6. Konflikt wokół Puszczy Białowieskiej jest poniekąd symptomatyczny dla polskich konfliktów w ogóle. Na przykład błędy poprzedniego rządu to m.in. zmniejszenie rozmiaru cięć w 2012 roku, co spowodowało rozwój gradacji *Ips typographus*. Kolejnym błędem było ustanowienie arbitralnej zasady dopuszczającej cięcia drzew i drzewostanów jedynie do wieku poniżej 100 lat, co jest bezpodstawne i nieuzasadnione naukowo.
7. Bez względu na to na ile gradacja *Ips typographus* w Puszczy Białowieskiej jest naturalna, jest to katastrofa, którą należy kontrolować i podjąć z nią walkę.
8. Najbardziej skutecznymi działaniami mającymi na celu zapobieganie gradacji *Ips typographus* są cięcia sanitarne. Aby były skuteczne, należy je przeprowadzać w odpowiednim czasie, zanim drzewa zostaną zniszczone, jeszcze przed wylotem z nich chrząszczy.
9. Cięcia sanitarne na obszarach objętych gradacją muszą być gruntowne. Jeżeli ścięte drzewa zaatakowane przez szkodniki nie mogą być wywiezione z lasu, należy je okorować. Korę z dorosłymi chrząszczami należy rozdrobnić lub spalić. Cięcia sanitarne prowadzone w sposób rygorystyczny, terminowy i skoordynowany przestrzennie mogą skutecznie zredukować populację chrząszcza i ograniczyć rozprzestrzenianie się jego gradacji.
10. Po dogłębnym rozważeniu wszystkich istotnych faktów zdecydowanie należy zalecić pilne podjęcie działań mających na celu ograniczenie dalszego rozprzestrzeniania się gradacji *Ips typographus*.

11. Prawo leśników, miejscowej ludności i przedstawicieli władz do głosowania przeciwko powiększeniu Parku Narodowego (Franklin 2002) jest uzasadnione zarówno z etycznego, jak i prawnego punktu widzenia oraz niepodważalne. Ponadto, jest to nieetyczne i nieludzkie wprowadzanie tego typu dużych zmian gospodarczych wbrew woli i interesom miejscowej ludności, która zależy od odnawialnych zasobów lasu i ich wykorzystania. Mieszkańcy powinni mieć prawo wniesienia znacznego wkładu w określenie kierunku rozwoju ich regionu.
12. Zdecydowanie zalecam, aby zarządcy regionu Puszczy Białowieskiej włożyli więcej wysiłku w edukowanie opinii publicznej na temat zdrowia lasu, jego wzrostu i rozwoju. We wszystkich miejscach wykonywania cięć należy instalować tablice informacyjne objaśniające ich cel oraz prezentujące ramy czasowe sukcesji lasu, z datami i ilustracjami poszczególnych etapów rozwoju odnowień drzewostanu po wykonanych pracach. Należy co miesiąc publikować „Komunikaty Prasowe" informujące opinię publiczną o bieżącej sytuacji lasu oraz o postępach prac badawczych. Należy przeznaczyć środki na regularną produkcję filmów dokumentalnych i wywiadów wspierających transfer wiedzy i edukację społeczeństwa w zakresie zarządzania lasem. Administracja leśna oraz organizacje lokalne powinny prowadzić stronę internetową poświęconą Puszczy Białowieskiej, ze wszystkimi bieżącymi informacjami oraz z najważniejszą literaturą na tematy z nią związane.

Prof. Klaus von Gadow m. in. stwierdził, że:

1. Nie podejmowanie żadnych działań może mieć katastrofalny wpływ na Puszczę Białowieską, skutkując zniszczeniem lasu przez kornika drukarza na ogromną skalę. Opanowane drzewa nie będą mogły dłużej przyczyniać się do redukcji emisji dwutlenku węgla. Te drzewa powinny być usuwane z drzewostanów odpowiednio wcześnie, aby spowolnić, a także, miejmy nadzieję, zapobiec rozwojowi gradacji.
2. Wprowadzenie podejścia opartego na koncepcji strefowości w Puszczy Białowieskiej (przypisanie konkretnym obszarom odpowiadających im możliwości i ograniczeń w ich użytkowaniu, które regulowałoby działania dopuszczalne na tych terenach) mogłoby być pierwszym krokiem w kierunku rozwiązania konfliktu. Stosowanie różnych wariantów zarządzania przestrzennego w małej skali, mogłoby okazać się korzystne i pomocne w tworzeniu nieprzerwanie ewoluującego krajobrazu, odpowiadającego jednocześnie zapotrzebowaniom ludzkiej działalności i zmieniającym się warunkom środowiskowym.

3. Szkody wyrządzane przez kornika drukarza w Puszczy Białowieskiej w zdrowych populacjach drzew, co zdaje się być wynikiem anomalii pogodowych, powinny być stale monitorowane, a zasiedlone drzewa usuwane, w celu zapobieżenia niekontrolowanemu rozprzestrzenianiu się gradacji. Sytuacja ta uległa zmianie w 2011 roku, kiedy to ówczesny Minister Środowiska, działając pod naciskiem zewnętrznych grup, drastycznie ograniczył wielkość cięć sanitarnych i możliwość usuwania zaatakowanych świerków. Od 2012 roku obszar niszczony wskutek gradacji kornika corocznie zwiększał się dwukrotnie, powodując w rezultacie środowiskową katastrofę na skalę niespotykaną do tej pory w Puszczy Białowieskiej.
4. Konflikt środowiskowy, który toczy się obecnie wokół Puszczy Białowieskiej może być rozwiązany tylko w kontekście przestrzennym: regulacje NATURA 2000 i UNESCO muszą być bardziej przejrzyste i kompatybilne, najlepiej uzupełnione o bazę danych GIS, co ułatwi precyzyjne planowanie przestrzenne.
5. Wprowadzenie zasady „braku działania" na tak dużym obszarze objętym gradacją kornika drukarza stanowi poważne zagrożenie dla integralności systemu. Stosowanie zasad ścisłej ochrony może mieć katastrofalne skutki, a ochrona ta powinna być ograniczona do obecnych granic Parku Narodowego, w wymiarze, który zaspokaja potrzeby turystyczne społeczeństwa.
6. Należy znieść zakaz pozyskiwania drewna w drzewostanach starszych niż 100 lat, ponieważ taki zakaz tworzy niezamierzoną zachętę do wykonywania cięć we wszystkich innych drzewostanach, zanim osiągną wiek 100 lat.
7. Podjęcie dodatkowych, stałych badań, z mapowaniem wszystkich drzew, jak również zakładanie kontrolnych powierzchni próbnych w celu dokonania oceny presji środowiskowej wywoływanej przez duże ssaki roślinożerne, stworzyłoby solidną, empiryczną bazę danych, jako podstawę do prowadzenia polityki w tym zakresie.
8. Puszcza Białowieska mogłaby stać się modelowym przykładem dla wynegocjowanego projektu krajobrazowego, który zaspokaja różne potrzeby i dostarcza całą gamę dóbr i usług środowiskowych oraz społeczno-ekonomicznych. Realizacja tej idei będzie możliwa, jeśli zarządzanie Puszczą będzie oparte na wynegocjowanym połączeniu przestrzennie zależnych różnych ścieżek zarządzania. Podejście takie pozwoli stworzyć dynamiczny krajobraz, charakteryzujący się mozaiką różnych siedlisk, wysoką bioróżnorodnością gatunkową i odpornością ekosystemów.
9. Krajobraz taki jak Puszcza Białowieska jest dokumentem ludzkiej historii, artefaktem stworzonym przez człowieka. W Puszczy Białowieskiej już wcześniej prowadzone były

działania związane z jej użytkowaniem i nasadzaniem drzew, a ich nasilenie jest notowane od XVIII wieku, kiedy to w Puszczy zostały wycięte drogi leśne o układzie geometrycznym i wyraźnie zaznaczyło się faworyzowanie sosny jako gatunku o wysokiej wartości ekonomicznej (Franklin, 2002). Według Falińskiego (1986) ślady ludzkiej działalności są widoczne na co najmniej 90% powierzchni lasów znajdujących się obecnie w granicach Puszczy Białowieskiej. Samojlik i in. (2013) dostarczają dodatkowych dowodów, przytaczając fakt, że w XVIII wieku w Puszczy Białowieskiej prowadzona była produkcja węgla drzewnego i smoły.

10. Zalecenia i wymagania prawne, włączając w to Ustawę o Lasach, regulacje dotyczące obiektu Światowego Dziedzictwa UNESCO oraz restrykcje nałożone w ramach programu NATURA 2000, są uwarunkowane przestrzennie. Pewne ograniczenia odnoszą się do konkretnych jednostek przestrzennych, ale nie mają zastosowania w innych.
11. Konflikty wokół kwestii ochrony przyrody przybierają na sile na całym świecie i powinny być rozwiązywane w taki sposób, aby minimalizować negatywny wpływ na bioróżnorodność gatunkową, warunki bytowania ludzi i dobro społeczeństwa (Redpath et al., 2013) .
12. Gradacje kornika drukarza są powszechnym zjawiskiem, obserwowanym w europejskich parkach narodowych. Ich wpływ na procesy ekosystemowe został dokładnie zbadany i jest już obecnie dobrze rozpoznany. Dlatego nie ma potrzeby zbierania dalszych dowodów w tym zakresie. Ciągłe i odpowiednio wczesne usuwanie drzew opanowanych przez kornika obniżyłoby zagrożenie pożarowe, zredukowałoby emisję dwutlenku węgla i przywróciłoby integralność ekosystemu. Na tym etapie, nie jest to kwestia pozostająca w gestii instytucji odpowiedzialnych za zarządzanie, ale wymaga politycznej woli działania.

Prof. John A. Kershaw m. in. stwierdził, że:

1. Dla niego osobiście odwiedzenie Puszczy Białowieskiej było jednym z najważniejszych wydarzeń w karierze leśnika, nie dlatego, że miał okazję zobaczyć nietkniętą ludzką ręką dziką puszczę, ale ponieważ przybył do miejsca ukształtowanego przez historię i ludzi, miejsca stanowiącego przykład walki o tożsamość lokalną, narodową, a może nawet kontynentalną lub globalną.
2. Puszcza Białowieska stoi w obliczu poważnej degradacji lasu, w szczególności jeśli chodzi o świerk pospolity i w mniejszym stopniu o sosnę zwyczajną, na skutek

gwałtownego zwiększenia śmiertelności drzew w wyniku gradacji kornika drukarza. Wydaje się, że przed rokiem 2011 rozprzestrzenianie się tego owada było ograniczone do minimum dzięki prowadzonym cięciom sanitarnym.

3. Dla współczesnych aktywistów ekologicznych las pierwotny to niczym niezakłócony krajobraz, nietknięty ludzką ręką, prehistoryczna pozostałość, gdzie rośliny i zwierzęta współistnieją ze sobą, gdzie przyroda wie najlepiej i gdzie wszystko zostaje na zawsze takie, jakie było kiedyś (Sunseri 2012). Nie trzeba zbyt daleko szukać, aby zobaczyć, że jest to wizja wykorzystywana obecnie przez aktywistów ekologicznych do podgrzewania emocji i zdobywania poparcia dla „ratowania" Puszczy Białowieskiej (Blavascunas 2012).
4. Na podstawie dostępnych dowodów można stwierdzić, że Puszcza Białowieska nie jest lasem pierwotnym. A przynajmniej nie jest nim w kontekście, którym posługują się dzisiejsi aktywiści ekologiczni, a mianowicie nie jest pozostałością dzikiego, dziewiczego lasu wymagającą ochrony przed ingerencją człowieka. Jest to pejzaż kulturowy (Schama 1995) z bogatą historią ludzkiego doświadczenia.
5. Restrykcyjne regulacje narzucone leśnikom w Puszczy Białowieskiej nie zapewniają mechanizmów gospodarki adaptacyjnej. Dopuszczono tylko jedno działanie eksperymentalne – nierobienie niczego. Działania polegające na nierobieniu niczego przyniosą rezultaty – niektóre z nich mogą nam się podobać, a z innych nie będziemy zadowoleni. Bez zadań, celów, mierzalnych kryteriów i pewnej dozy zrozumienia granic dopuszczalności nie mamy możliwości oceniania dobra naszych działań z zakresu gospodarki leśnej. Bez nich działanie polegające na nierobieniu niczego staje się interesującym, lecz niestety niepowtarzalnym (i potencjalnie katastrofalnym) eksperymentem.
6. Racjonalne planowanie ekologiczne wymaga pewnego stopnia elastyczności, ponieważ ekosystemy są dynamiczne. Jeśli nie jest uwzględniana naturalność zmian, te plany są skazane w taki czy inny sposób na niepowodzenie (Botkin 1990; Lee 1993; Bormann i in. 1999).
7. Gradacja kornika drukarza o niespotykanej dotąd skali nie jest naturalna. Zamieranie świerków stanowi wielką stratę zarówno pod względem gospodarczym, jak i estetycznym. Zaleca się natychmiastowe działania w celu ograniczenia rozprzestrzeniania się kornika drukarza, przywrócenia dostaw drewna do lokalnej gospodarki, odnowienia lasu, niezależnie od wartości martwych i umierających świerków.

8. Restrykcyjne regulacje programu Natura 2000 i inne decyzje w dużej mierze ignorują miejscową ludność zamieszkującą tereny Puszczy Białowieskiej. Czuje się ona wywłaszczona i ignorowana. Przepisy spowodowały zmniejszenie lokalnego zatrudnienia ze względu na mniejszą ilość drewna dostępnego dla lokalnych tartaków. Miejscowa ludność musiała przerzucić się na kupowanie węgla o niskiej kaloryczności do ogrzewania domów, ponieważ nie ma wystarczająco dużo drewna opałowego.
9. Podejście zakładające „nierobienie niczego" sugeruje, że „przyroda wie najlepiej". Ten punkt widzenia z pewnością wyraża się w podejściach do gradacji kornika w Puszczy Białowieskiej. Podczas rozmów z naukowcami i zarządcami wyznającymi zasadę „braku działania" oraz w trakcie czytania ich prac napotykał poglądy typu „kornik oczyszcza Puszczę Białowieską ze świerka", „zatrzymujemy ludzkiego raka, który toczy Puszczę" czy „co ma być to będzie, przyroda wie najlepiej". Jednak przyroda nie „wie" nic, przyroda nie jest wszystkowiedzącą czującą istotą. „Przyroda" jest zbiorem poszczególnych organizmów konkurujących (wewnątrzgatunkowo i międzygatunkowo) o ograniczone zasoby, napędzanych przetrwaniem najlepiej przystosowanych i często niepokojonych przez zdarzenia losowe.
10. Ponadto prof. Kershaw rekomendował: opracowanie koncepcji zarządzania adaptacyjnego, które obejmuje współpracę obywatel–zarządca–naukowiec (aktywiści ekologiczni wykorzystują mity związane z Puszczą Białowieską w celu wywłaszczenia miejscowych obywateli i zdyskredytowania, a nawet szkalowania zarządców lasów); dokumentowanie wpływu zwierząt kopytnych na strukturę lasu; wyraźne rozróżnienie między Białowieskim Parkiem Narodowym, a trzema nadleśnictwami.

Dr Patrick Moore m. in. stwierdził, że:

1. Ludzie i drzewa współegzystują ze sobą już od stuleci w Regionie Puszczy Białowieskiej. Już sam ten fakt powinien pokazywać, że wykorzystywanie drzew w celu pozyskania drewna nie jest zagrożeniem dla lasu, o ile profesjonalne zarządzanie zapewnia zrównoważone zbiory.
2. Istnieje duża różnica między tym, co jest „naturalne" i tym, co jest „pożądane". Gradacja kornika drukarza, który zabija ogromną liczbę drzew, jest oczywiście zjawiskiem naturalnym, zachodzącym w przypadku wystąpienia określonej kombinacji czynników środowiskowych. Ale jest ona jednym z najbardziej niepożądanych zjawisk w lesie, który jest wykorzystywany do m.in. produkcji drewna. Jedynym jeszcze gorszym zdarzeniem jest może tylko rozległy pożar lasu. Istnieje tylko jeden skuteczny sposób

ograniczenia gradacji bez zmarnowania umierających drzew. Drzewa należy wyciąć, dopóki mają jeszcze wartość gospodarczą i dokonać nasadzeń nowych drzew, wykorzystując środki uzyskane m.in. z pozyskania drzew zasiedlonych przez korniki.

3. Kiedy las usuwany jest na stałe, jak w przypadku wyrębu lasów na potrzeby rolnicze lub miejskie (wylesianie), utracone zostaje siedlisko wielu gatunków organizmów, które znikają w danym krajobrazie. Odnowienie lasów pozwala jednak utrzymać siedliska gatunków leśnych i jednocześnie zapewnić zrównoważoną podaż drewna. Innymi słowy, w przeciwieństwie do wielu sposobów użytkowania gruntu, zaletą zrównoważonego leśnictwa jest utrzymywanie siedliska gatunków, przy jednoczesnym wspieraniu istotnej części gospodarki i zapewnianiu ludziom odnawialnego źródła energii.
4. Dla leśnika przeszkolonego w zakresie gospodarki leśnej oczywiste jest, że opisana powyżej reakcja na gradację kornika drukarza jest logicznym sposobem postępowania. Tylko ktoś owładnięty romantyczną wizją, kto nie rozumie istotnego wkładu gospodarczego, jaki wnosi las na rzecz społeczeństwa, może być innego zdania.
5. Ponadto dr Moore rekomenduje:
   - Lokalne społeczności muszą być bezpośrednio zaangażowane w podejmowanie decyzji, które wpływają na stabilność, zatrudnienie, rentowność i jakość życia oraz muszą mieć prawo dostępu do informacji, do uczestnictwa w planowaniu zarządzania lasami i monitorowania wydajności przemysłowej.
   - Całe pozyskiwane drewno cenne z komercyjnego punktu widzenia należy wykorzystać, aby uniknąć strat gospodarczych. Musi to być zrównoważone z potrzebą pozostawienia leżaniny i materii organicznej w ilości wystarczającej do zapewnienia siedliska fauny i składników odżywczych dla kolejnego pokolenia drzew.

Reasumpcja opinii i rekomendacje Rady Naukowej Leśnictwa

Biorąc pod uwagę treści wszystkich czterech analizowanych opinii oraz zalecenia i szczegółowe uwagi ekspertów, Rada Naukowa Leśnictwa przedstawia następujące rekomendacje:

1. **Należy dokonać analizy obowiązujących obecnie ustaw i rozporządzeń dotyczących Puszczy Białowieskiej, a jej wyniki wykorzystać w procesach planowania i**

zarządzania. Sposób zarządzania Puszczą Białowieską jest przedmiotem licznych krajowych ustaw i rozporządzeń, a także podlega szeregowi międzynarodowych ograniczeń: istnieją obszary, na których pozyskiwanie drzew jest kontrolowane zgodnie z przepisami dotyczącymi NATURA 2000 i wymogami listy światowego dziedzictwa UNESCO. Złożoność częściowo sprzecznych ograniczeń prawnych i administracyjnych utrudnia proces planowania i proces decyzyjny oraz codzienne zarządzanie. Przepisy dotyczące programu Natura 2000 i UNESCO muszą być bardziej przejrzyste i najlepiej zarejestrowane w bazie danych GIS, aby ułatwić szczegółowe planowanie przestrzenne i gospodarcze. Szczególne dyrektywy dotyczące programu Natura 2000 i UNESCO należy przypisać poszczególnym elementom, aby rozróżnić złożoną „dżunglę" przepisów. Należy m.in. zweryfikować wytyczne do podziału Puszczy Białowieskiej na 4 strefy UNESCO w kierunku połączenia 3 i 4 strefy, przy pozostawieniu dla tych połączonych stref wytycznych obowiązujących obecnie w 4 strefie.

2. **Trzeba zakwestionować społeczną i gospodarczą dopuszczalność dogmatycznej zasady polegającej na "nierobieniu niczego" propagowanej przez aktywistów ekologicznych i przedstawicieli niektórych grup społeczno-zawodowych.** Istnieje pilna konieczność podejmowania działań i zarządzania w związku z konfliktem w obrębie 3 nadleśnictw Puszczy Białowieskiej. Wstrzymanie się od podejmowania działań może mieć katastrofalny wpływ na Puszczę Białowieską, ostatecznie skutkując zniszczeniem lasów na szeroką skalę, stanowiąc poważne zagrożenie dla integralności ekosystemu.

3. **Zdecydowanie należy podjąć natychmiastowe działania w celu ograniczenia rozprzestrzeniania się kornika drukarza.** Należy w porę i nieustannie chronić drzewostany zdrowe poprzez wczesne usuwanie drzew zasiedlonych przez kornika drukarza. Jest rzeczą niezwykle ważną, aby cięcia sanitarne odbywały się w sposób skoordynowany, w odpowiednim czasie i zakresie przestrzennym. Zamieranie świerków stanowi wielką stratę zarówno pod względem gospodarczym, jak i estetycznym. Istnieje konieczność przywracania poprzedniego stanu drzewostanów lub ich przebudowy z dostosowaniem do siedliska oraz przywrócenia ciągłości dostaw drewna dla lokalnej gospodarki. W tym celu konieczne jest opracowanie i wdrożenie strategii dla 3 nadleśnictw Puszczy Białowieskiej wykorzystującej doświadczenia ze realizowanej strategii dla Beskidów. Podjęcie działań to nie jest przede wszystkim kwestia zarządzania, lecz problem woli politycznej do podjęcia działań. Podjęcie działań jest konieczne, aby ograniczyć emisje

CO_2, zmniejszyć ryzyko wystąpienia pożaru i spowolnić dalszy rozpad zdrowych drzewostanów. Obecna faza gradacji kornika nie jest naturalna. Wpływ gradacji na ekosystemy jest zjawiskiem dobrze poznanym. Nie ma potrzeby dalszego zbierania jakichkolwiek dowodów w tym zakresie. Powinniśmy myśleć o korniku jako o drzewnym odpowiedniku wirusa Ebola, albo malarii u ludzi. Tak, wirus Ebola i malaria są „naturalne", ale są naszymi wrogami, tak jak kornik drukarz jest wrogiem drzew i lasu.

4. **Należy dokonać likwidacji zakazu ingerencji gospodarczej w drzewostanach ponad 100-letnich.** Ogólny zakaz pozyskiwania drzew i drzewostanów starszych niż 100 lat jest nieproduktywny, nieuzasadniony naukowo i należy go zlikwidować ponieważ stanowi niezamierzoną zachętę do pozyskiwania drewna we wszystkich drzewostanach dużo wcześniej, zanim osiągną one próg wiekowy wynoszący 100 lat.

5. **Ścisła ochrona może mieć katastrofalne skutki i należy ją ograniczyć do obecnego terytorium Białowieskiego Parku Narodowego i rezerwatów dla których opracowano plany ochrony.** Drzewostany znajdujące się poza obszarami objętymi ścisłą ochroną powinny być zarządzane z wykorzystaniem najlepszych umiejętności zawodowych lokalnych leśników oraz zgodnie z najlepszymi praktykami leśnymi. Podejmując decyzję o ochronie czegoś musimy zadać sobie pytanie co właściwie chronimy. Miejsce? Proces? Strukturę lasu? Ideał? Wszystkie decyzje w sprawie Puszczy Białowieskiej, niezależnie czy dotyczą Białowieskiego Parku Narodowego czy jednego z trzech nadleśnictw, to decyzje dotyczące gospodarki leśnej. Dobre decyzje w zakresie gospodarki leśnej wymagają dobrych danych i jasno określonych zadań, celów, działań, mierzalnych kryteriów i akceptowalnych wyników.

6. **Trzeba podjąć próbę stosowania filozofii gospodarki adaptacyjnej.** Adaptacyjna gospodarka leśna to proces „uczenia się przez działanie". Gospodarka adaptacyjna uznaje działania zarządcze i podejścia polityczne, które je ograniczają, za eksperymenty, z których można się uczyć. Zrównoważone gospodarowanie ekosystemami jest idealnie dopasowane do filozofii gospodarki adaptacyjnej. Gospodarka adaptacyjna uznaje znaczenie ludzkich potrzeb, jednocześnie konfrontując się z rzeczywistością, która pokazuje, że zdolność naszego świata do zaspokajania tych potrzeb w sposób ciągły ma swoje granice i zależy od funkcji ekosystemów. Restrykcyjne regulacje narzucone Puszczy Białowieskiej nie zapewniają mechanizmów gospodarki adaptacyjnej, gdzie dopuszczono tylko jedno działanie eksperymentalne – nierobienie niczego. Racjonalne planowanie ekologiczne

wymaga pewnego stopnia elastyczności, ponieważ ekosystemy są dynamiczne. Jeśli nie jest uwzględniana naturalność zmian, te plany są skazane w taki czy inny sposób na niepowodzenie.

7. **Rozważenia wymagają działania, które mogą zapobiec przyszłym konfliktom.** Należy do nich koncepcja nowego podziału przestrzeni leśnej na rejony gospodarki leśnej, gdzie każdy rejon powiązany jest ze wskazówkami dotyczącymi gospodarki leśnej (np. „działania są niedozwolone", „działania są dozwolone w normalnych warunkach" oraz „działania są dozwolone w szczególnych warunkach"). Koncepcje podziału na rejony są łatwe do zrozumienia i po zaakceptowaniu zapewniają natychmiastowe podstawy praktyczne w odniesieniu do zarządzania. Takie podejście może stanowić pierwsze realne rozwiązanie w zakresie rozstrzygnięcia konfliktu; przestrzenne mieszanie różnych wariantów na niewielką skalę w oparciu o nowe teorie pragmatyczne może jednak ostatecznie okazać się bardziej wskazane w tworzeniu ciągle zmieniającego się krajobrazu, w odpowiedzi na potrzeby człowieka i zmieniające się warunki środowiskowe.

8. **Należy dokonać analizy skutków zagęszczenia w Puszczy Białowieskiej dużych zwierząt roślinożernych i prowadzić długookresowe ich monitorowanie.**
Intensywne żerowanie dużych zwierząt roślinożernych wpływa na strukturę i skład gatunkowy drzewostanów. Duże ssaki roślinożerne spełniają rolę filtra poprzez faworyzowanie bardzo niewielu gatunków, ograniczając tym samym naturalną różnorodność. Populacje dużych ssaków roślinożernych należy kontrolować, aby zapobiegać dalszemu zmniejszaniu się różnorodności biologicznej. Dzięki ogrodzonym działkom możliwa będzie obiektywna ocena wpływu ich zagęszczenia i żerowania na strukturę lasu, co stanowiłyby solidne empiryczne podstawy dla tworzenia polityki w tym zakresie.

9. **Przy podejmowaniu decyzji o istotnym znaczeniu odnośnie do form ochrony przyrody i gospodarowania w Puszczy Białowieskiej należy brać pod uwagę stanowisko i dobro miejscowej ludności.** Stabilizacja lokalnej gospodarki realizowanej w regionie Puszczy Białowieskiej, która opiera się na ciągłości zatrudnienia i możliwości wykorzystania drewna opałowego oraz innych produktów leśnych przez miejscową społeczność, powinna zostać podniesiona jako najważniejsza kwestia, wymagająca dużo uwagi w całej debacie. Stwierdzono, że restrykcyjne regulacje narzucone przez program Natura 2000 i inne organy

w dużej mierze ignorują miejscową ludność zamieszkującą tereny Puszczy Białowieskiej. Przepisy i podjęte działania spowodowały zmniejszenie lokalnego zatrudnienia.

10. **Należy podjąć działania medialne i upowszechniające wiedzę celem zwiększenia poziomu edukacji publicznej.** Wynika to z faktu, iż większość spornych kwestii dotyczy indywidualnych stanowisk moralnych i filozoficznych. Przykładowo:
    a. Trzeba intensywnie wykorzystać media dla wyjaśniania procesów zachodzących w przyrodzie, informowania społeczeństwa o podejmowanych działaniach, odzwierciedlenia poglądów leśników z terenu 3 nadleśnictw Puszczy Białowieskiej starających się podejmować działania do walki z kornikiem oraz odnawianiem lasu w celu zapewnienia utrzymania siedlisk oraz trwałości ekosystemów leśnych.
    b. Należy wypracować sposób komunikowania się ze społeczeństwem dla wyjaśniania podstawowych zasad traktowania przyrody, gdyż różne koncepcje są często wykorzystywane jako demagogiczne narzędzia, służące do manipulacji opinią publiczną. W tym celu należy przygotować i realizować strategię medialnego kontaktu ze społeczeństwem.
    c. Istnieje potrzeba wzmożonej dyskusji, aby ponownie ocenić rolę ekoetyki i powiązanych systemów normatywnych dotyczących unikalnych zalesionych krajobrazów, takich jak Puszcza Białowieska.
    d. Jest konieczność uświadomienia społeczeństwu istotnego faktu: lasy stanowią jak dotąd najważniejsze źródło energii odnawialnej i zasadniczego surowca dla cywilizacji ludzkiej – tj. drewna. Uzyskanie drewna wymaga wycięcia i przetworzenia drzew.
    e. Należy podejmować dyskusję i "walkę" z mitami o Puszczy Białowieskiej i naiwnymi poglądami typu:
        - „natura zawsze będzie źródłem najwyższej różnorodności" lub „natura zadba o siebie", „kornik oczyszcza Puszczę Białowieską ze świerka", „zatrzymujemy ludzkiego raka, który toczy Puszczę" czy „co ma być to będzie, przyroda wie najlepiej". Jednak przyroda nie „wie" nic, przyroda nie jest wszystko wiedzącą czującą istotą. „Przyroda" jest zbiorem poszczególnych organizmów konkurujących (wewnątrzgatunkowo i międzygatunkowo) o ograniczone zasoby, napędzanych przetrwaniem najlepiej przystosowanych i często niepokojonych przez zdarzenia losowe, co może w konsekwencji doprowadzić do utraty cennych siedlisk i gatunków,

- mit, że Puszcza Białowieska to „ostatni las pierwotny" w Polsce i Europie, "nie tknięty ludzką ręką", podczas gdy na podstawie dostępnych dowodów można stwierdzić, że Puszcza Białowieska nie jest lasem pierwotnym, a ślady działalności człowieka są widoczne na co najmniej 90% obecnego terytorium Puszczy.

Omówione w niniejszym dokumencie opinie ekspertów z Niemiec, Stanów Zjednoczonych Ameryki Północnej i Kanady, a także wcześniejsza opinia Rady Naukowej Leśnictwa z dnia 11 marca 2016 roku, oraz liczne wizyty studyjne członków Rady na terenie LKP Puszcza Białowieska, rozmowy z gospodarzami terenu oraz przedstawicielami lokalnej społeczności, dyskusje na konferencjach naukowych w różnych środowiskach leśnych i przyrodniczych w kraju i za granicą, oparcie się na wiedzy naukowej z zakresu nauk leśnych oraz nauk entomologicznych, biologicznych i ekologii, stanowi przesłankę dla Rady Naukowej Leśnictwa do zalecania **pilnego opracowania** przez Regionalną Dyrekcję Lasów Państwowych w Białymstoku **strategii ograniczania gradacji kornika drukarza** oraz **przebudowy zamierających i zamarłych drzewostanów świerkowych jako jednego zwartego** PLANU DLA NADLEŚNICTW LEŚNEGO KOMPLEKSU PROMOCYJNEGO „PUSZCZA BIAŁOWIESKA".

Przy opracowywaniu strategii należy uwzględnić również inne metody ograniczania liczebności kornika drukarza, wymienione w Instrukcji Ochrony Lasu, a nie tylko usuwanie drzew zasiedlonych (posuszu czynnego) z drzewostanów świerkowych przed wylotem chrząszczy, np. wykładanie pułapek feromonowych, a także doświadczenia leśników zdobyte przy realizacji PROGRAMU DLA BESKIDÓW, ratującego dziesiątki tysięcy hektarów świerczyn w górskich terenach naszego kraju.

- . -

Integralną częścią sporządzonego przez Radę Naukową Leśnictwa „Podsumowania opinii sporządzonych przez zagranicznych ekspertów, wybitnych uczonych – ekologów i leśników, dla Kancelarii Prezesa Rady Ministrów Rzeczpospolitej Polskiej" są 4 angielskojęzyczne oryginały opinii ekspertów zagranicznych, załączone w Aneksie do niniejszego opracowania.

Warszawa, 30.09.2016 rok

Rada Naukowa Leśnictwa

przy Prezesie Rady Ministrów Rzeczpospolitej Polskiej

Przewodniczący Rady - Prof. dr hab. inż. Janusz Sowa .....

Członkowie Rady:

Prof. dr hab. inż. Bogdan Brzeziecki .....

Prof. dr hab. inż. Jacek Hilszczański.....

Prof. dr hab. inż. Tadeusz Kowalski .....

Prof. dr hab. inż. Stanisław Miścicki.....

Prof. dr hab. inż. Jerzy Modrzyński .....

Prof. dr hab. Jerzy Starzyk .....

Dr hab. inż. Stanisław Małek, Prof. UR .....

ANEKS

Opinie o konflikcie środowiskowym wokół Puszczy Białowieskiej

Situational Evaluation Report

prepared for the President of the Council of Ministers of the Republic of Poland, regarding the *Ips topograhus* outbreak in spruce stands within the area of the forest districts: Białowieża, Browsk and Hajnówka included in the Promotional Forest Complex of "Puszcza Białowieska"

by

Prof. dr. Eng. Chris J Cieszewski -- the international group of experts

Summary

The report presented here contains expert opinions regarding recommended course of forest management actions necessary to appropriately address the issues emerging from the runaway outbreak of *Ips typographus* in the region of "Puszcza Bialowieska", further called the Bialowieza Forests or for short BF. The opinions presented here are based on: i) over 45-year long international forestry professional experience of this author; ii) thorough research of the involved issues in the considered region and on the international arena; iii) research of various similar insect outbreaks and their consequences in other countries; iv) multiple discussions with relevant international experts and the members of this international group of senior scientists asked for advice on this matter; and v) on studying unsolicited correspondence from individuals submitting to the ideology of Ecologism, called here "Ecologians".

The most important aspects of this report focus on addressing the two following most compelling questions: i) should the forests outside of the strict reservation areas be managed to protect them from the *Ips typographus* infestations, or should they be neglected for the sake of Ecologism? and ii) should the strict reservation area of the Bialowieza Forest be expanded to a larger territory? The later question belongs greatly in the domain of politics; and therefore, it is rather peripheral to the main focus of this author's investigation; however, it is addressed here to the extent to which it relates to the factual and professional arguments in the dispute over this subject.

The recommendations emerging from the author's investigation of this matter are as follows. First, the forests outside of the strict reservation areas should be managed to the best of the professional abilities of the local foresters, and according to the best forestry practices, to contain, or at least to limit, the *Ips typographus* outbreak. It is important that the removal of the infested trees be done timely -- before the beetle kill the trees and fly out of the trees onto the next trees -- and spatially coordinated buffering of the infested areas for up to 1 km^2 in order to inhibit the insect spread. This conclusion is based on the best understanding of the sciences of silviculture, knowledge of *Ips typographus* morphology and consequences of its infestations, and in seeking the most optimal nature representation in the forest, striving for the greatest biodiversity and health and growth vigor of the forest populations, which will be severely impaired if the current policy of passive management and neglect is sustained.

Second, it is the opinion of this author that the strict reservation area should not be expanded to other parts of this region. It is recommended that before such a decision is even considered, there be explicitly identified individuals agreeing to pay for such an experiment, all the consequences of its implementation, including the damages to the economy, ecosystems, and welfare of the local population and the impact on the land prices. It is important also that in the

ongoing dispute the financial interests of all the participating individuals, and their institutions, be readily disclosed to the public, and the open access information sources list all the past, present, and potential future, financial gains (e.g., grants and any other material benefits) of the individuals, and their institutions, taking part in the BF public dispute over its functions and management.

Last but not least, there should be more explicit consideration in the BF public dispute given to the importance of the welfare of local population. The stabilization of the BF local economy, with the continuing associated employment and use of firewood and other forest products by the local population, should be elevated to the most important consideration in this dispute.

Background

Definition of some terms

The following terms are used in this report:

- **Political Ecology** -- ideology exploiting relationships between political, economic, social, and environmental issues (Forsyth 2004) contrary to the science of **Ecology**, which does not politicize the environmental concepts.
- **Ecologism** -- a branch of **Political Ecology** based on the position that the non-human world is worthy of moral consideration, and that this should be taken into account in social, economic, and political systems (Baxter 1999).
- **Ecologians**[1] -- is the new term introduced here defining those specializing in **Ecologism** (an ideology) as opposed to **Ecologists** who specialize in the science of **Ecology**.
- **'Natural' Nature Pretense**[2] (NNP) -- an entity managed for the resemblance of a "natural" ecosystem or formation, usually corresponding to currently *politically correct* views on how to manage make-believe unmanaged Nature.
- **Misinformation** -- inaccurate information.
- **Disinformation** -- intentional misinformation.

Basic Premises

The Bialowieza Forests (BF) are very important to everyone. This is evident from the fact that in the dispute about BF everybody argues their various points of view on the bases of the forest uniqueness and its precious values. It is also clear that the BF has been managed and utilized to some degree for hundreds of years; although, there are disagreements about the extent and the role of this management and its impact on the development and forming of the current BF habitats and their species compositions. Nonetheless, the BF management practices in terms of, for example, feeding, fencing and securing life of the bison, produces the most remarkable, and the closest to nature, reservation of the bison population not found anywhere else in the world. This very human management of bison populations in Poland, with objectives of maintaining the

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[1] The translation of **Ecologian(s)** to Polish is "***Ekologian(ie)***".

[2] The translation of 'Natural' **Nature Pretence** to Polish is "***Niby Naturalna Natura***".

healthy stock, is the best illustration of the human ability to do a better job than nature does in maintaining natural populations alive and in good health.

There are documented records showing that the BF have been harvested in the past, and that many trees there have been planted. It is evident that the greatness of the BF has come about in the presence of man made forest management, and possibly even thanks to it. Accordingly, many of the arguments against maintaining the forest management in BF, in general, are ill-founded, because, for example, such forest qualities as species richness, or biodiversity, can be achieved to much greater extent under a designated to these qualities forest management than under a conservation scenario of doing nothing, as in a case of the strict reservation. Finally, it is clear that everyone wants the BF region to continue to be managed, except that some want the management to be subsidized and focused on maximization of NNP, while others want the management to be sustainable and focused on maximization of forest growth and health. Stating that creating a strict reservation is a "no-management option" is inaccurate and misleading, because running a conservation park requires also administration and R&D implementation as well as constant interference, and the actual main differences are just the abovementioned: subsidized versus self-generated funding, and maximization of NNP instead of the forest vigor and health. The differences between the two advocated management strategies lead to a public division over whether the whole BF should be subjected to a strict reservation policy. Since this is a part of a political dispute, to which this author has very limited input, this report will focus mostly on the issue of the sound forest management and the stewardship of the natural resources and the local population.

The current predicament in the BF includes the runaway infestation of *Ips typographus* beetle killing the spruce trees and having the potential to attack and kill also other species, such as *pinus*, *abies*, and *larix* (GISD 2016, ISC 2016). This infestation creates a great danger for the whole BF, and, if not contained, also for all other forests connected to the BF or adjacent to it territories. This *Ips typographus* infestation spiked out drastically since 2012, when the cuts have been reduced, and since then it is on the uptake in terms of the number of generations per year, the territory of its spread, and the number of trees killed. The danger created by this infestation is not only in killing trees and spreading an out-of-control infestation of *Ips typographus* but also in creating unsanitary conditions of standing dead timber, which, if not removed, will create major fire and health hazards while contributing significantly to the release of greenhouse gases, such as CO2, which reverses the positive role of forests CO2 sequestration and oxygen production.

Technical versus Political considerations

The BF is a subject of many debates and it presents a combination of various interesting and uninteresting problems. The interesting problems include the challenges in pest management and Forest Protection against insect infestation and fire hazard threatening the very existence of this magnificent region. Interesting are also investigations of the human management and utilization history in the BF that spans for hundreds of years. Finally, BF offers unique opportunities for studies of forest structure and its successions that include various native and nonnative to this region species as well as comparisons of the strict reservation forests with the managed forests.

The uninteresting problems include various political agendas that are played out in relation to this region especially that the local population ends up being victimized as a result. The politics between different fractions of the society seem to be led by a variety of forces, such as political manipulators, and international Ecologians[3], or "Political Ecologists", all usurping the rights to interfere with the Polish authorities and natural resources pushing the BF politics towards the demise of the very extraordinary achievements that were realized under the Polish school of Forest Management.

The situation of the BF conflicts is somewhat symptomatic to Polish conflicts in general. For example, the previous government's errors included, among others, the reduction in cuts in 2012, which resulted in the escalation of the *Ips typographus* infestation. Another mistake was establishing an arbitrary rule limiting logging and stands to the age below 100 years, which is ill-founded and irrational.

Moreover, the question whether BF is a primeval forest is irrelevant to what the management decisions should be in light of forest calamities resulting in massive mortality and the insect population increasing annually at alarming rates. Thus, in the opinion of this author, the real essence of the BF considerations relies on a few principal matters that need to be carefully considered. The first consideration is the matter of assumed ethics and moral standards. They decide what is right and what is wrong and how should we guide our actions to be fair and honest to all. The second consideration is the matter of communication and understanding of the basic principles related to nature, since such concepts are used frequently as demagogical devices of public manipulation and they need to be addressed on the bases of relevant technical knowledge. Finally, an important part is the knowledge of the *Ips typographus* management and methods of dealing with it, so that all the other efforts are not wasted due to a lack of proper technology and know-how.

The Problem Definition

This report treats the problem of BF insect infestation as the main consideration requiring immediate attention and resolution. This issue is treated as a technical know-how problem with specific management prescriptions that need to be implemented as soon as possible in as efficient and accurate manner as possible.

The secondary problem here is associated with the question if the BF strict reservation should be extended to the whole BF area, or to what extent should limitations of forest management be imposed on different areas of the BF.

Pertinent literature

There exists massive literature available on the subjects of the BF, its history of forest utilization and human intervention, and all other subjects pertinent to, or associated with, the existing BF disputes. However, there was no need for citing here much of the available literature, because getting distracted by individual sources would only cloud and dilute the very fundamental bases

[3] I define "Ecologian" as a person who is representing Ecologism. Ecologism is a relatively newly defined ideology, which doesn't seem to have an established naming for a person studying, or practicing it, while the word "Ecologist" is already reserved and represents the Ecology.

of this discourse. This discourse is based on knowledge of sciences related to forestry and on the sense of logic and ethics explained here. Most of this report is based on simple facts, which for an experienced forester and scientist should be obvious without any explicit literature, and for laymen it should be convincing enough based on the credentials of the author and the tractability of the presented arguments.

Thus, for example, the question whether the strict reservation should be extended to the whole region, is independent from the literature and the research on the subject of the origin of BF, because the local population have both moral and legal rights to self-determination, and the only literature relevant in this case could be the 1997 Poland's Constitution, the 1992 UN Declaration on the Rights of Minorities, and the Framework Convention for the Protection of National Minorities, which are all political documents rather than scientific works. The same answer would apply if the BF were indeed a primeval forest. A similar answer applies to whether foresters should have the right to cut down tress that are going to be killed by beetle? There is no need for the literature to derive the simple arguments that beetles should not have more rights than human beings, that the dead trees are dead no matter who killed them, and that it is better to create employment in the region, so that local people can put food on the table, rather than to increase unemployment and poverty.

Where scientific literature is needed, such as for the determination of the best management practices in managing *Ips typographus*, I have provided adequate sources that can be used for further research or comparing management options. The best sources regarding *Ips typographus* outbreak treatments include: Müller et al. (2008), Stadelmann et al. (2013), and Wermelinger et al. (2012). An excellent general review of the literature regarding this insect and its management options can be found in Wermelinger (2004) and other publications by the same author, who also was so kind as to help this author to compile a prudent set of prescriptions for managing *Ips typographus* infestation.

For those who might be interested in a lucid and elaborate discussion of the mechanisms of Political Ecology (e.g., Forsyth 2004, Robbins 2011), or Ecologism (e.g., Smith 1998, Baxter 1999), in relation to romanticizing BF through the creation of myths, I recommend Franklin (2002). This masterpiece of a discourse is a grand diatribe against the political manipulations towards turning the managed BF into an observational lab with complete disregards to the needs and rights of the local population. Finally, there is nothing more engaging than a truly old genuine original account of someone capable from the distant past, who gives the best image of authenticity and with proper consideration may offer the highest verity of the past in our search for truth. In this category the most exceeding and engaging position is Brincken (1828), in French, which among others describes the BF historical utilization of the forests by the local population.

Over all, reviewing the subject of the BF related issues I have considered hundreds of publications ranging from the most germane seminal works, through less notable publications, to the supporting sources cited in considered works, and finally to gray literature and WebPages. However, I see no benefit of citing all these sources here, or to even just list but a few of them, because the subject matter is really not in the scientific research realm but rather in the ethical

and logical realm that, once the obstructing noise of propaganda settles down, has a very simple basis.

Ethics and moral standards

The consideration of ethics and moral standards of this author are based on several simple principles.

First, the basic moral and ethical standards are defined by the "Golden Rule" of applying the same equal measures to the others as to oneself, as well as the implied by this rule treating of everyone equally. For example, if one takes care of himself and uses medicine to cure his own diseases, one should support the same for others. By the same rule, if one treats others as oneself then one should respect all others as deserving equal privileges and rights among themselves.

Second, it follows from the above that various actions have to be judged on the bases of their merit as desirable, or undesirable, regardless of who is participating in them. It is not reasonable to assume that dead trees are acceptable when killed by the beetle, while claiming that they are unacceptable if they are killed by humans. For moral considerations, resolving whether killing a tree is desirable has to be resolved separately from the question whether the dead tree is left in the forest, because dead trees can be left or removed in either situation. At the same time, it is reasonable to claim that removing a dying tree from the forest has a greater merit in limiting the greenhouse gasses due to deadwood decay, in preventing the spread of the insect infestation destined to more killing of even more trees in the future, and also in salvaging the value of the wood. We may not forget that the decaying deadwood in the forests constitutes a major source of greenhouse gases contributing to global warming, which nowadays is considered a serious treat to the natural environment. This argument alone has the power to resolve the ethical and moral question about sanitarian cuts of the trees infested by *Ips typographus* in the BF.

Third, it is a matter of both logic and ethics to treat all values consistently. Accordingly, if in consideration of damages from insect infestation 12% of dead trees, which is the percentage of spruce in species composition of BF, is a "small" and insignificant portion of the whole that is likely to be killed by *Ips typographus*, then the same 12% of trees harvested in sanitarian logging must be also considered insignificantly small portion of the same whole. Any dualism in the interpretation of significance of the same proportion of trees dying is unwarranted. Factoring in, in addition, that the sanitarian cuts are targeting trees that are about to die one way or another, leaves the moral judgment of sanitarian logging incontestable within any rational and unbiased discourse.

Fourth, the first rule implies a consideration of the welfare of others, which means in this case the BF local population. The interests of the local population, employment, regional revenue, per capita, as well as the way of living of the local population relaying on various uses of BF (e.g., firewood and other forest uses) should be one of the major premises and considerations in any regional decisions regarding this region management and development. It is both unwise and immoral to treat any region of the world as free-for-all property with experimental parcels for outsiders, such as the external lobby of Ecologians and politicians, who do not make any material contributions, financially or otherwise, to support this region, but dare to claim benefits at the expense of the local populations in this region.

Fifth, one needs to strive for the best possible management defined by the principles of the sustainability, accountability, and responsibility towards our children and other present members of our society. Striving for sustainability means that the entity is self-carrying at a non-depleting level, so that over time it will not decrease in its capability to function, which is contrary to the conservation propositions. Accountability means legitimate and benevolent management of resources, both financial and natural. Responsibility towards our children means that we need to leave them as many resources as we can manage to improve or at least maintain. A responsible management includes avoiding high risks based on speculative promises of alleged benefits in a distant future.

Finally, it is good to define what would be the most unethical and immoral thing to do in the matter of deciding about the welfare of the BF and its regional local population. The decisions of this type must be made in good faith, keeping in mind only the best stewardship of the forests and the region, without any hidden agendas or potential benefits deriving from decisions benefiting the arguing party. It is unethical to take sides in this discussion by those who benefit from grants, studies, lobbing support, or don't have complex technical knowledge of the Forest Protection, Management, Utilization and Silviculture, as well as have not studied in depth the subject of the present *Ips typographus* infestation, its management and potential consequences of its neglect.

Natural processes and human management

The meaning of "natural"?

An act of nature does not have to be "natural". The argument of defending "natural processes" above all is used frequently, following the Ecologians, by people who believe that somehow even the bad things happening in nature are desirable providing they happen without human input for the reason that they can then be classified as "natural". The reason why the word "natural" is frequently equivalent with the word "good" is that it has connotations with desirable developments that are consistent with expectations, usually in the best harmony with the progress and development of life as we know it; in some way the meaning of "natural" is similar to "historical" and it suggest something expected and predictable.

However, one should not confuse the meaning of the word "natural" with the meaning of "act of nature". Normal people do not use the word "natural" to describe catastrophic events of nature, such as devastating hurricanes and tornadoes, wild fires, slathering wastefully whole flock of chicken by a fox in order to eat only one of them, a man or an animal hit by a lighting, or massive mortality caused by a plague or other epidemics. On the contrary, such events are more likely to be called "freaks of nature", "natural disasters", or even simply "disasters". Such events are nature failures when it becomes unstable, because its equilibrium mechanisms get out of balance due to out of ordinary reasons (e.g., a drought). Accordingly, it is important to be clear on that issue that the runaway *Ips typographus* outbreak is an act of nature that is unnatural and disastrous -- it is a failure of nature to maintain balances in its population dynamics. The failing equilibrium of nature can be a result of some kind of anomalies, such as for example a dry year stressing the trees and resulting in an out of ordinary succession of the insect keeling trees and promoting its population unnaturally fast ahead of its adversaries.

Next, even if something is actually "natural" it may be highly undesirable. A misunderstanding associated with the use of the word "natural" is that people tend to think selectively about the good things associated with the usage of the word "natural" and ignore the fact that some actually "natural" phenomena may be bad and highly undesirable. There is a common bias in that people prefer to think about the good things avoiding thinking about the bad things when using the word "natural", which creates biased anticipations regarding the situations described as "natural". A typical tendency in reaction to something described as "natural" is to applaud it and leave it alone as something on its right course of development. This is not a rational, wise, or even a moral decision regarding some bad and undesirable developments regardless of how natural they may be. For example, while it is natural to catch occasional pneumonia, and just about everyone goes through it on occasion, every normal person is fighting it with medicine as soon as it is identified. The same applies to many other diseases and "natural" disasters, such as accidental fires, floods, hurricanes, accidents, etc., or in this case the *Ips typographus* galloping insect propagation.

Undesirable "natural" phenomena require human intervention. There is a disparity of cause-effect in consideration of whether something natural, if it's undesirable, can be prevented through interference with other factors, which may or may not be natural. A simple illustration of this is that people who find out that it is "natural" in their family to smoke and to die early of heart attacks, take special precautions against such condition and quit smoking, so that they can avoid the "natural" course of developments and live longer and healthier lives. By the same token even if similar to the present situation catastrophic calamities of *Ips typographus* had been taking place in the past, so that they could be claimed "natural" in BF, the intelligent and moral aptitude towards this kind of disease would be to try to stop, contain, or at least limit it.

In short, the above section can be summarized as follows:

- the *Ips typographus* epidemic in BF is not "natural" even though it is an act of nature;
- even if this epidemic were "natural", in the sense that similar infestations would have been regularly observed in the past, it would be a "natural disaster" as most epidemics are;
- regardless how "natural" this disaster is, it should be fought against and managed.

The meaning of "Natural Processes"

Natural processes are often interpreted as processes unintended by human beings. This is an erroneous definition. Not only it excludes humans from being a part of nature, which is unreasonable, but, what's worse, such a definition also does not distinguish between the meanings of natural versus synthetic, versus out of ordinary, or versus any other types of processes normally not taking place in nature. Natural processes are processes that normally occur in nature spontaneously, while processes that do not normally occur in nature spontaneously, or are extraordinarily rare, are normally not called "natural".

Growth of trees is a natural process regardless whether it takes place in managed or unmanaged stands, which were seeded by humans or by birds. Similarly, tree mortality, whether due to killing by insects, or by tree competition, is a natural process in any stand, or forest, unless it is an excessive outcome of out of ordinary circumstances, such as epidemic. Almost all plant and wildlife dynamics in any managed, or unmanaged, forest, result from natural processes, that

occur spontaneously in nature, and that includes grazing and collecting berries alike, whether the grazing is done by a cattle, or by wildlife, and whether the berries are collected by bear or by humans. It is only when the process is not spontaneous, or out of the ordinary (i.e., unpredictably unusual), it can be considered unnatural.

Since man's planned actions are assumed to be not a part of natural processes, the tree planting and harvesting are usually not considered a part of natural processes either. On the same grounds, the feeding of bison and deer by humans are not natural processes. Yet, these kinds of human interventions to natural processes are highly desirable, and they promote and support the natural processes rather than conflict with them or contradict them. Competent forest management is very benevolent for nature by protecting it from extraordinary disruptive events, such as fires and other calamities, as well as securing desirable species representation and species richness -- if so desired. Along with human interaction with nature the natural processes are omnipresent in every forest and, one can have much more readily available access to observing many natural processes in a responsibly managed and utilized forests than in a corresponding strict reservation (i.e., as compared managed mixedwood vs. mixedwood strict reservation or managed monoculture vs. monoculture strict reservation).

The claim that all natural processes are determined by competition and survival of the fittest, which is supposed to result in the strongest possible natural selection processes, is also inaccurate. For example, a tree producing a billion seeds during its lifetime, of which only one, or a few at best, can survive to replace it, but the great majority of which never get any chance to compete, because their seedlings in their early stage of growth get either eaten by the ungulates, or the seeds fall on a poor bed and never even germinate. It is a simple matter of probability that if a great majority of the seeds never get a chance to compete, and there is no such thing as competition of seedlings with ungulates, then the strongest and the fittest individuals will not likely survive, while the actual survivors can be only the best of a small portion of the whole population; and therefore, most likely, they are mediocre. This is precisely why all the historical studies show that thousands of years ago the trees were not smaller then they are now; if the natural selection among trees were indeed the primary factor determining natural processes, the trees today would be much superior in growth and size than the trees thousands of year ego. In contrast, humans improve tree growth and yield tremendously wherever they intend to do so-- far beyond nature's natural selection capabilities. This can be observed on various intensive management plantations of pines, poplars, and eucalyptus, all over the world.

The above clarification is relevant to the BF dispute regarding the possibility of extending the strict reservation area, since one of the arguments presented frequently in favor of the expansion of the strict reservation is that the natural regeneration, in absence of human intervention, would produce superior trees due to natural selection and survival of the fittest. The truth is actually the opposite. Most of the tree seedlings in BF never get the chance to face intraspecies competition, or even interspecies competition from other tree species, but rather they get grazed by the ungulates. In this way the surviving seedlings, if any, are based on individuals that are not the best growing, or the healthiest, but merely the luckiest that somehow escaped attention of the grazing animals, which could even be a result of some kind of inferiority making them look less attractive than other healthy plants. On the other hand, the BF fenced regeneration areas are, in fact, just about the only areas in BF where the natural regeneration of coniferous seedlings

undergo processes of intraspecies competition, or natural selection, and submit to the scenario of the survival of the fittest. This is accomplished by blocking the predominant factor of the ungulates' grazing, providing site prep, and removal of major impediments from the site, that is done by the humans, who this way prevent the intraspecies competition from indiscriminately obliterating the majority of seedlings.

Securing natural processes through strict reservation has its uses and justification, but it is the least efficient and fruitful way of studying and observing natural processes, because it illustrates only one random path of many outcomes that can take place in nature out of millions, or billions, of possibilities. Nature functions by constantly evolving subject to infinite number of random possibilities functionally dependent on conditional probabilities of multiple events, such as climate and various weather phenomena at different functionally connected locations and times. Studying nature in a strict reservation is similar, in principle, to studying the dice based on a single throw, or actually, it is more like studying random a number generator based on a single number draw -- it's very inefficient and unrepresentative. It gives only one example of what could happened with the given state of the world rather than the understanding, or illustration of, various possible processes. In addition, the single outcome represents an unnatural environment, which is isolated from its interaction with humans in an artificially planned and organized fashion that is implemented by humans. Those who claim that by creating a strict reservation mankind can enable nature to create a "primeval forest" are merely speculating relying on their imagination and no real data, or experience, to back up this kind of claims.

Human management

One of common fallacies is the claim that nature knows best what to do, and that human management cannot do better than nature does. The first fundamental error in this assertion is that nature is actually capable of knowing anything, because it is not a rational entity. However, even if we assume that genetic codes in nature contain some kind of algorithms, which could be interpreted as a part of a body of "knowledge", then we still need to consider that nature doesn't have any means, or possibilities, of any kind of planning, optimization, or determination of goals for nature as a whole, which are the necessary ingredients of "knowing what to do". Basically, the functioning of nature consists of a multitude of spontaneous random events that are subject to conditional probabilities dependent on various individual elements of the environment. The assumption that there exist a state of the world towards which nature wants to be destined, and that this is some kind of climax world with a great richness of species living in harmony, is a myth. There are many examples in the world where nature took its natural course, and it repeatedly has produced simple monocultures that comprise fewer species than many managed forests. There are also managed forests in the world, such as the mixedwoods in the Southeastern USA, that have over 160 species of hardwoods alone and uncountable number of all other species of plants and animals.

The multitudes of the natural, fire-origin, forests in Western Canada are mostly monocultures. Human forest management in Canada reduced greatly nature calamities, such as forest fires, and greatly improved forest growth conditions of such species as lodgepole pine (*pinus concorta*), which naturally could not regenerate without a major hot fire burning down the forest first. Such regularity from a global warming point of view is highly undesirable. Moreover, when

regenerating naturally, this species may seed in excess of 1.2 million trees/ha (Smithers[4] 1957, p. 5), which results in a stagnation of whole stands from crowding, because this species is naturally not capable of self-thinning. Almost nothing else can grow in such stagnated lodgepole pine stands, because of the starving conditions associated with excessive light and nutrient competition. These were, beyond any doubt, natural forest stands untouched by human hand, on good and poor sites alike. These 100% natural forests were: species poor and growth poor. Only with human forest management lodgepole pine became the great species it is now in the second growth stands, when planted in lower densities, yet excelling in growth and yield production stands that, with some light able to penetrate the forest canopy and getting to the bottom of the forest, have also much greater biodiversity and species richness than the natural stands.

An example of dramatically disastrous outcomes of nature with *Ips* beetle runaway outbreak is the current gradation of *Ips* pine beetle in British Columbia, Canada. This out of control outbreak has already damaged over 18 million ha of pine forests in British Columbia – twice the area of the entire Polish forests – despite the efforts of containing it through the sanitation cuts, which proved to be too slow to contain it and could not keep up with the gradation. By 2012 there were already over 720 million m^3 of merchantable timber lost due to this outbreak and projections for 2017 have been in excess of 750 million m^3. It is the greatest natural disaster of this type known in the history, and it is likely to continue and spread to Alberta and other areas (see the projections at: https://www.for.gov.bc.ca/ftp/HRE/external/!publish/web/BCMPB/Year13/Cumulative%20Pine%20Killed%20-%201999%20to%202020.gif).

Finally, a good example of superiority of human forest management over nature self existence is the case of forest regenerations on the St. Helen Mountain after the volcano eruption destroyed all the forests there. Various Ecologians argued then that nature would regenerate by itself, while the Weyerhaeuser Company, a private forest product corporation, which owned a part of the land on that mountain, followed the path of manmade forest management practices and manually replanted the site with special site preparation and planting techniques. Today, side by side, unmanaged government lands and private corporation managed forest are the testimony for the superiority of the human management over the unattended nature's ability to manage crisis. Where man planted and managed the forest there is a beautiful, healthy and productive, tree population growing, almost ready now for harvest and subsequently another replanting. On the contrary, on the conservation lands with no human help rendered, there are pitiful fields with merely grasses and occasional shrubs having bugs as the last frontier before being declared as a wasteland. This startling comparison can be viewed here: http://www.weyerhaeuser.com/files/2814/3511/6950/mt_st_helens_a_new_forest_emerges.jpg

[4] Available online at: http://nofc.cfs.nrcan.gc.ca/bookstore_pdfs/30531.pdf.

Figure 1: Pictures copied from the link above. On the left is Weyerhaeuser's employee planting the trees on a site destroyed by volcano eruption; and on the right is the green forest from that planting next to the brown areas – near-wasteland of the unmanaged government park.

Ips typographus and its management

Because of its importance, *Ips typographus* has been studied by many scientists who published many articles on the subject. Wermelinger (2004) provides an excellent review of knowledge and the pertinent research literature on the subject. In essence, *Ips typographus* beetle attacks healthy trees by getting under their bark and eating tree phloem, the thin life vascular layer, under the bark of the tree, transporting the organic nutrients of the tree.

The most effective preventive actions against *Ips typographus* is based on sanitarian cuts (Wermelinger 2004). To be effective these cuts have to be conducted timely before the trees are killed and the insects fly out of the tree, and the fallen trees must be removed from the forest. In addition, the cuts should be performed on all susceptible to *Ips* typographus infestation trees, such as *picea*, *pinus*, *larix*, and *abies*, in the vicinity of the infested trees up to 1 km^2 of the surrounding areas. According to Dr. Beat Wermelinger[5], the world authority in *Ips typographus* management:

> *"if within a km2 some infestation spots are salvaged and some are not, the efficiency in bark beetle control is very low. This has been demonstrated e.g. in the NP Bavarian Forest where they set up a buffer zone at the park borders of some 500-1500m in which new attack was rigorously removed (only grey German literature, e.g. Nüsslein, S., Faisst, G., 2000. Buchdrucker-Massenvermehrung im Nationalpark Bayerischer Wald. Allg. Forst Z. - Wald 55, 651-653). Another example is Switzerland where ... [3 words deleted by the author] statistical analysis could show the effect of sanitation felling (Stadelmann et al. 2013)."*

This may be a great challenge if the area of infestation is large and the spots of infestation are scattered. If the labor availability is a problem, or the magnitude of the infestation exceeds the

[5] Personal Communication with Dr. Beat Wermelinger: email dated Aug. 23, 2016.

harvesting capability of local management, then it is recommended to concentrate the cuts on the buffer areas that separate high intensity infestation areas from low intensity infestation, or healthy areas, to limit the spread of the outbreak.

The cuts in the infested areas need to be thorough, timely, and inclusive of all surrounding healthy trees, and, as mentioned above, the cut down trees still containing bark beetle broods must not be stored in the forest, or at its edge, allowing the beetles to complete their development and emerge. If the cut down infested trees cannot be removed from the forest, they have to be debarked before storing. Debarked residues can be left untreated in the wood as long as the brood is in the white stage (larvae, pupae). Bark with adult teneral beetles has to be chipped or burnt. If conducted rigorously, timely, and in spatially coordinated manner, the sanitarian cuts have good chance to be effective in bringing down the beetle population and reducing the spread of the infestation. If within a 1 km^2 the cuts miss some infestation spots, the effectiveness of the sanitation may be gravely hindered.

Cutting the infested trees late, if not possible otherwise, may be required due to fire and safety hazard, reducing the greenhouse gases, and providing open space for regeneration, as well as potentially providing some income from salvaging the dead trees; although, the value of infested trees may be severely reduced by the fungus infection assisting *Ips typographus* infestation. Unfortunately, late cutting does not help with controlling the insect infestation, and it might hider development of some *Ips typographus* important natural enemies, which as reported in Wermelinger et al. (2012) remain up to 1 month longer in the stem than the bark beetles. Furthermore, according to Wermelinger[6] removing infested trees exposes adjacent trees to intensive isolation, which stresses them and may make them more vulnerable for bark beetle attacks. It is possible that in some situations, when the sanitarian cuts cannot be performed timely, and the safety and fire hazard is not an issue, some killed trees might be left behind, standing or fallen, as a resource in forest ecosystems providing hotspots of biodiversity for vertebrates, invertebrates, fungi, mosses, and lichens (Müller et al. 2008).

Recommendations

Managing the Ips typographus outbreak

After careful consideration of all pertinent facts, **I strongly recommend urgent actions** against further spread of the *Ips typographus* outbreak. It is gravely important that the sanitarian cuts be done in a timely and spatially coordinated fashion securing logging buffers of about 1 km^2 around the identified infestation areas where all susceptible to the beetle infestation species be removed. The infested trees have to be cut and removed from the forest before they are killed by the beetle and before the insects fly out of the tree.

The recommendation of the urgent sanitarian cuts may likely depend on some other considerations, such as local labor, forest conditions, the risk of fire and safety hazards. While the sanitarian cuts would be the most desirable and effective when conducted on all infested

[6] Personal communication with Beat Wermelinger (emails dated Aug. 23 and 26, 2016) who explains that as a practitioner's knowledge discussed on discussion forum (e.g., in German: http://www.waldwissen.net/waldwirtschaft/schaden/insekten/wsl_erfahrungen_borkenkaeferfallen/index_DE http://www.waldwissen.net/dossiers/fva_dossier_borkenkaefer/index_DE).

areas, the consideration of the economic stability of the region may require that the intensity of the sanitarian cuts be determined by the local labor availability and the growth and yield sustainability calculations to ensure continuity of the forest growth, regional employment sustainability, and healthy economic development of the region and its population.

It is important to keep in mind that every infested uncut tree that is killed by *Ips typographus* is not only a waste of jobs, income, wood and oxygen, and the source of greenhouse gasses and fire and safety hazards, but it is also an additional *Ips typographus* breading habitat, which in addition takes up the space otherwise available for young trees to grow.

Strict reservation area and local population

The claims in support of extending the area of the strict reservation in BF are based on questionable premises that are politically motivated and have no merit in any of the important areas of considerations. This subject is well researched and there are no doubts in the opinion of this author that the "legitimacy of the foresters, local inhabitants, and government representatives to vote outright against the National Park enlargement" (Franklin 2002, p. 1478) is well founded and from both ethical and legal points of view is incontestable. Furthermore, it is both unethical and inhuman to conduct this kind of major economic changes against the will and interests of the local population, which depends on the forest renewable resources and their utilization. The local population should have the right for a significant input into determining the course of development for their region. They should be encouraged to organize into local organizations able to voice publicly their opinions on the development of BF region and on the ultimate policies that are applied to their region forests, and their welfare and economic development should constitute one of the most important considerations in making the decisions about the forest policies in BF.

As well documented in Franklin (2002), the local population rights to determine the character of their region is guaranteed through the Poland's Constitution of 1997 (Article 35), by political instruments of the 1992 UN Declaration on the Rights of Minorities, and the Framework Convention for the Protection of National Minorities that came into effect in Poland in April 2001 (Framework Convention, Articles 4.2 and 15). Accordingly, any public discussion of the subject of BF that does not consider the needs of the local population and their livelihood, e.g., proposing an extension of the strict reservation, should be treated as an assault against that population's wellbeing and that of its minorities.

Public education and perception

I is strongly recommended that the managers of the BF region put a serious effort into public education about the forest health and its growth and development. All harvesting areas should have installed billboards explaining the cuts and timeframe of the forest succession with the dates and illustrations of various developmental stages of the present regeneration following all loggings. There should be monthly "Press Releases" informing the public about the current situation of the forest and progress of any ongoing R&D. Funds should be designated to regular production of documentaries and interviews supporting the knowledge transfer and public education on the subjects of forest stewardship. The forest management along with the local organizations should host a website dedicated to the BF with all current information and the most important literature on the related subjects.

A very urgently needed public education topic in the theory and practice of the sanitarian cuts that are necessary for reducing beetle outbreaks. Their scope and extent has to be explained to the public, along with the beetle morphology and the dynamics of its propagation. This is especially important, because to be fully effective the sanitarian cuts have to be carried out on infested and not infested trees alike of the species susceptible to the *Ips typographus* infestation on relatively large buffering areas of 1 km^2 around the infestation spots. Finally, there should be funding provided for studies of the infestation management effectiveness and of the forest structure with special emphasis on the comparison of the structures between the managed part of BF and the BF strict reservation sites, while the managed part of the BF should have at different areas diverse objectives regarding the forest biodiversity and species representation.

Country scale general crises' management

Many of the recent Polish public debates and crises are rooted in propaganda publicizing misinformation and even disinformation (i.e., intentional misinformation). My recommendation for this unhealthy situation is to introduce a formal "*Bill of public right to legitimate information*", which would grant the people mislead by inaccurate information rights to financial compensation from the source of the inaccurate information. In addition, the disinformation (i.e., an intentional misinformation) should be treated as crime and be punishable by law, while propaganda (i.e., propagation of partial information with intention to bias the public to promote some specific political goals) should be specifically taxed to raise funds for public education and clarifications of biased interpretations. Unless the government of Poland introduces some accountability to public information institutions, it will remain in chaos and disarray with dire consequences for the whole country and all its inhabitants.

Conclusions

The final conclusion is that the present forest authorities in Poland are failing the proper forest management by giving in to political pressure created by foreign capital owned media, professional Ecologians, other "Political Ecologists", and Crisis Environmentalists, mislead the population perpetuating illegitimate stories about why forests should be neglected, and by foreign politicians interfering into Polish internal affairs. If that were the end of the story I would classify it as simply wrongful lack of responsible management. However, the extent of the damage is much greater and it encompasses human factor resulting in damage to the local population, which is effected by this situation through increased unemployment and through lost privileges of using the BF wood that they used to be able to utilize in the past. Because of that I classify this situation as reprehensible and unacceptable and am strongly voicing my objection to it on both the humanitarian and the professional grounds.

Disclaimer

Opinions expressed in this report are mine and mine alone, and they are based on my best understanding of the involved science and ethics applicable to all the discussed issues. I have no conflicts of interests whatsoever with any entities associated with the BF dispute, and my opinions expressed in this report are fully unbiased and unrelated to any kind of soliciting or special interests of any groups, organizations, or institutions. The main pertinent opinions expressed in this report have been formed during my research of this matter and they have not

had a previous bias or prior, nor had I had any collaboration pertinent to this work with any of the involved in this matter Polish forestry sector employees or managers.

Acknowledgment

I'm grateful to all the individuals participating in the organization of our trip to Bialowieza Forest, to the local foresters and forest managers, and to the representatives of the local population, for taking time to talk to us and explaining the factual issues related to this subject matter.

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I'm also grateful to those who were trying to influence this process by writing unsolicited letters to me with arguments against the forest management, which allowed me to thoroughly familiarize myself with all the arguments from both sides and to develop a better and more comprehensive understanding of all arguments, allowing me in turn to develop a better grounded and more righteous judgment on this matter.

Finally, thanks are also due to those who tried to influence my judgment using biased interpretations of pertinent facts (e.g., re. *Ips typographus* killing trees in the strict reservation), or using slanders towards the leaders of the current government --- regardless their unprofessional character, these interactions helped me to better understand the mechanisms of the public dispute over this matter, and I appreciate this unexpected enlightenment.

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The Bialowieza Conservation Conflict

Report to the Chancellery of the Prime Minister of Poland

Klaus v. Gadow (3 September, 2016)

Summary: This report discusses issues and presents recommendations related to the current conservation conflict. Additional recommendations are intended to prevent future conflicts.

Recommendations related to the current conflict

a) Discontinue the large scale application of a dogmatic "No Action" rule within the Bialowieza landscape, as this represents a serious threat to ecosystem integrity. Taking no action can have catastrophic effects on the Bialowieza forest, eventually resulting in large scale destruction of the forest by the spruce bark beetle. Infected trees would no longer contribute to reducing CO_2 emissions and the risk of fires would increase. Trees infected by *Ips typographus* should be salvaged timely and continuously to slow down, and hopefully prevent, the further collapse of healthy tree communities.
b) Notwithstanding recommendation (a) above, the interests of environmental activists may require the application of 'no action', limited to the current National Park, in the short term to satisfy tourism demands. This decision should be reviewed in the longer term when the damage to the ecosystem by the "No Action" dogma will undoubtedly become clearer.
c) Discontinue the general ban on harvesting stands older than 100 years as it is counter productive; it creates an unintended incentive to harvest all stands well before they reach the threshold age of 100 years.
d) Specific Natura2000 and UNESCO regulations need to be assigned to individual compartments, to disentangle the complex "jungle" of rules.

Additional Recommendations to prevent future conflicts

e) Additional permanent observational studies with mapped trees, as well as control plots for assessing the browsing pressure of large herbivores, would complement existing field plots in Bialowieza and would constitute a sound empirical basis for policy formation.
f) A zoning approach may present a first feasible solution in solving the conflict; but small-scale spatial mixing of different options may eventually turn out to be preferable in generating a continuously evolving landscape in response to human demand and changing environmental conditions.
g) Bialowieza Forest could become a showcase model of a negotiated landscape design providing a wide range of environmental and socio-economic goods and services.

The forestry professionals who accompanied us during the field trip are highly dedicated environmentalists and experienced managers who, in consultation with qualified entomologists and pathologists, are very capable to deal with the current catastrophe. However, it may help if their views are more widely reflected in the media.

1 Background

Bialowieza Forest, a national treasure to the people of Poland, is also of particular interest to the international research community because of its large area, interesting history (Sekowski, 2011) and long status of protection (Pommerening et al., 2016). About 40 percent of the area of Bialowieza Forest is located in Poland, the remaining 60 percent in Belarus. The part in Poland comprises four distinct spatial entities: the Bialowieza Forest District (12 593 ha), the Bialowieza National Park (10,517ha), the Browsk Forest District (20,417 ha) and the Hajnówka Forest District (19,654 ha). The Bialowieza, Browsk and Hajnowka districts constitute the "Promotional Forest Complex "*Puszcza Białowieska*".

1.1 The Spruce Bark Beetle

The Spruce Bark Beetle has always been part of the Białowieża forest ecosystem. *Picea abies* and *Ips typographus* are both native, and both have evolved together. Under normal conditions, the beetle prefers physiologically weakened trees. However, as populations increase, healthy hosts may be attacked. The damage to live tree communities in Białowieża Forest, which appears to have been caused by abnormal weather conditions, was continuously monitored and infected trees were salvaged to prevent an uncontrolled proliferation. The situation changed in 2011 when the Minister of Environment, under pressure from external groups, drastically limited sanitary removals of infected spruce trees. Since 2012, the forest area destroyed by the beetle has doubled each year, resulting in an environmental catastrophe of previously unknown proportions in Białowieża Forest. This has resulted in an environmental conflict which is characteristic for bark beetle proliferations in other regions of Europe (Stadelmann et al., 2013).

Ruschkowski et al. (2011) found that in 2005, more than 95% of the mountain spruce forests in the *Bavarian Forest* National Park were destroyed by uncontrolled bark beetle infestations resulting in extensive areas of standing and lying dead wood covering nearly 6,000 ha. This caused a complete change of the landscape character and deeply affected the perception of the park authorities. A similar environmental disaster, caused by a policy to "let natural processes prevail" has also been observed in the *Harz* National Park in Germany.

1.2 Acts and Regulations

The management of Bialowieza is subject to various national Acts and Regulations as well as a series of international restrictions: there are areas where tree harvesting is controlled subject to the regulations of NATURA 2000[1] and the requirements of the Polish-Belarusian UNESCO

[1] The Natura 2000 network of nature protection areas in the territory of the European Union includes Special Areas

World heritage site "Bialowieza Forest". This includes nature reserves and "reference areas"; special landscape protection areas for certain bird species; protection of "nature monuments" as well as "pioneer" and wetland forests (Perkowski, 2015). The recommendations and legal requirements involving the Forest Law, the regulations of the UNESCO World Heritage Site and the restrictions imposed by *Natura 2000* are spatially relevant: specific restrictions apply to some particular spatial units, but may be irrelevant in others. Therefore, the Bialowieza conservation conflict can only be resolved within a spatial context: **The Natura2000 and UNESCO regulations need to be made more transparent, preferably in a GIS database, to facilitate spatially explicit planning.**

The complexity of the, partly contradictory, legal and administrative restrictions complicate planning and decision-making and day-to-day management. The State Forest Administration has a statutory obligation to protect the forest and to ensure its continued existence by preventing further destruction while item 9 of the UNESCO Directive does not allow intervention into "natural processes" in certain areas. The "Habitats" directive of *Natura 2000* specifies the preservation of habitats of importance for the Community, which in the case of a large scale bark beetle gradation is impossible without human intervention.

1.3 Dispute over the National Park

Jerzejewski and Jerzejewska (1995) published a widely disseminated paper that called for the National Park to be extended to the whole forest, which resulted in the doubling of the size of the National Park. The dispute over the National Park produced some strange and weird activism. Franklin (2002) reports that a biology student from Finland (who had never visited Bialowieza himself, but claimed to have received information from the bird society OTOP) wrote in an email that the "electric saws are still being heavily used" in the primeval forest of Bialowieza where ecological and evolutionary processes have been taking place "for millions of years". That email was copied to addresses around the world. Protests were held in Ottawa, London, Edinburgh, and Copenhagen by people who had never visited Bialowieza, to prevent the "impending destruction of the forest by the local foresters". It seems that the more distant people are from Bialowieza, the greater the concern.

Most landscapes are a symbol of the fundamental links between local communities and their heritage (Schama, 1995; Rössler, 2006). A landscape, like the Bialowieza forest, is a document of human history, a man-made artefact (Jackson, 1984; Taylor, 2008). Lewis (1979) refers to landscape as a clue to culture. If there is a desire to create a wilderness, then the

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of Conservation (SACs) and Special Protection Areas (SPAs) designated to protect particular types of forests and wetlands.

outcome, the human-created wild landscape, is a reflection of that particular culture. It seems that the social and ecological history of Bialowieza is being mythologised. There are photographs showing artificial smoke rising among majestic trees to create illusive effects. Such visual tricks show the landscape not as it is, but as a paradise of illusion ((Franklin, 2002; Gutowski, 2000). The love of nature is a basic human sentiment that may be aroused by tales of unspoilt wilderness, or when people are shown an idealized impression of "Nature", as presented for example, in romantic paintings of forested landscapes[2].

Białowieża Forest has suffered the full impact of forceful lobbying. **Fact** is that the existing National Park is a thoroughly altered, worked-over landscape that has always served the needs of its inhabitants. Sensational media reports created the **myth** that Białowieża is a "dying forest destroyed by foresters". Most affected by the sensationalism are the local people, who know that the forest needs to be managed to promote tree species diversity within healthy ecosystems, and who therefore consider the enlargement of the National Park to be unnecessary and even harmful.

Conservation conflicts are increasing world-wide and need to be managed to minimise negative impacts on biodiversity, human livelihoods and well-being (Redpath et al., 2013). **The large scale application of a dogmatic "No Action" rule within a settled landscape represents a serious threat to ecosystem integrity. Strict protection can have catastrophic effects and should be limited to the current Białowieża National Park to satisfy the demand for tourism.**

2 The Current Conflict

Ecosystem management is a "magnet for controversy" between an eco-centered world view and the multiple services paradigm (Lackey, 1999). Blicharska and Van Herzele (2015) refer to the long-term impasse caused by strongly polarised perspectives when different actors were seeking to influence the situation, utilising concepts from their own discourse, often strongly linked to their institutional identity. In spite of the scientific character of much of the debate, most of the divisive issues are not scientific, but clashes over individual moral and philosophical positions. It is therefore difficult to harmonize these issues.

Naive statements like "nature will always produce the highest diversity" or "nature will take care of itself", are usually well meant, but the practical consequences may be totally unexpected and even catastropic. If there is a desire to create a wilderness, then the outcome will be a

[2] as presented for example, in Shishkin's famous romantic painting "A morning in the pine forest", Утро в сосновом лесу of 1889. However, at closer inspection this romantic picture revered by so many, reveals stark nonsense: the sow with her three bear cubs was added later by Konstantin Savitsky.

human-created landscape that may create a feeling of wildness. **Fact** is that the forest was originally more open (Peterken, 1996, p. 80; Vera, 2000, p. 265). Pollen profiles analysed from peat bogs in the National Park show increases in the charcoal/pollen ratio from around 1430 (Mitchell and Cole, 1998, p. 1049), which supports evidence that the forest was intensely settled during the 6th to 12th century (Gorska, 1976, p. 128) and that arable farming and animal husbandry were practised in the forest through the clearing of meadows (Franklin, 2002). Hedemann (1939) also reports extensive forest use during previous centuries. Niklasson et al. (2010) found that fires were very frequent from 1653 to the late 1700s. Fires were recurring at very close intervals, supporting an open, *Pinus*-dominated forest. Human influence on the fire regime was probably substantial. Such evidence, painstakingly collected by dedicated scientists in Bialowieza Forest is essential to support policy and decision-making.

Environmentalism has long seen its job as protecting nature from human exploitation. Over the past few decades, it has become clear however, that this effort no longer makes sense (Wapner, 2014). **Nature, as we are beginning to realize, does not exist apart from humanity** and the world we will inhabit is the one we have made (Purdy, 2015). It seems that more discussion is needed to reassess the role of environmental ethics and associated normative systems relating to unique forested landscapes like Bialowieza. "Naturalness" is a concept which is important and widely employed, yet ambiguous and contentious (Haydon, 1997). It is not possible to measure and objectively evaluate the degree of "naturalness" (Sprugel, 1991; Winter, 2012).

Patch-driven bark beetle outbreaks are very difficult to manage (Økland et al., 2016). **Therefore, trees infected by *Ips typographus* should be salvaged timely and continuously to reduce CO_2 emissions, lower the fire risk and slow down, and hopefully prevent, the further collapse of healthy tree communities.** The specific ecosystem dynamics following a Spruce Bark Beetle outbreak are well known (Müller et al., 2010; Nováková and Edwards-Jonášová, 2015), and there is no obvious need to maintain additional open air laboratories by protecting uncontrolled bark beetle proliferations.

Cole (2012) reviews developments during the past half century. Contrary to expectations, he found that managing exclusively for naturalness did not serve to protect all wilderness values and purposes. What is needed is a richer articulation of goals and purposes, using concepts that describe desirable attributes of wilderness ecosystems in terms other than the absence of human impact. **The general ban on harvesting stands older than 100 years is counter productive and should be discontinued, because it creates an unintended incentive to harvest all stands well before they reach the threshold age of 100 years.**

Sokolowski (1999, p. 214) reports that a considerable amount of exploitation and replanting has taken place in Białowieża, especially since the 18th century when a geometrical pattern of roads was cut through the forest, and pine trees were favoured as an important economic resource (see also Franklin, 2002[3]). According to Falinski (1986, p. 487), traces of human activity are visible on at least 90% of the present forest boundaries. Samojlik et al. (2013) provide evidence of charcoal and wood-tar production in Bialowieza during the 18th-century. Possibly one of the most significant human impacts was the maintenance of high populations of large herbivores for royal hunting through the centuries. Wiecko (1972, p. 180 sqq) reports that the last yew trees, a species known to be particularly vulnerable to browsing, disappeared in Bialowieza during the 19th century. He also lists a number of invading tree and animal species foreign to the local flora and fauna (see also Okolow, 1994, page 19).

(Birks, 2005) explains that in the "wood-pasture hypothesis", large herbivores create gaps and thus determine forest structure, whereas in the "high-forest hypothesis", forest gaps and structure are created by wind-throw, tree death and other disturbances, rather than by herbivores. Large herbivores, which are protected in the Bialowieza National Park, act as a filter by favouring very few species capable of withstanding the browsing pressure, thus reducing the natural species diversity (Kuijper et al. 2010a, b; Brzeziecki et al., 2016[4]; Pommerening et al., 2016). **Special control plots for assessing effects of browsing would complement existing field plots in the Bialowieza Park and thus contribute to a better understanding of this very important issue.**

3 Preventing Future Conflicts

At least two conditions are required to avoid a major conflict: knowledge of the impending problem and the political will to act (Carment and Garner, 1999; Woocher, 2001). Pabian and Jaroszewicz (2009) emphasize that "Management should always aim at finding a balance between biodiversity conservation, sustaining of ecosystem services and assuring fair distribution of the costs and benefits of conservation, especially to local inhabitants". This is not a trivial task. The practical implementation of that vision is possible using an integrated approach that is based on new theories of landscape design.

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[3] "The existing National Park, ..., is a thoroughly altered, worked-over landscape that has, in all probability, evolved from open wood-pasture where oak and hazel flourished and herbivores and cattle roamed: where the practices of forestry and farming were once indistinguishable. It has been a forest landscape that has, for 12 000 years, served the economic, cultural, and spiritual needs of its inhabitants albeit under considerable constraint. The dispute over the management of the National Park, orchestrated by the scientific elite, has been fuelled, I have argued, more by the power of representation, myth and Zeitgeist than by sound evidence".

[4] Jaroszewicz et al. (2016) do not agree with Brzeziecki et al. (2016)

3.1 Zoning

The primary purpose of zoning is to assign land use opportunities and restrictions to specific areas, regulating activities which will be acceptable, and thus preventing land-use conflicts. Zoning has been proposed in Canada as a means to offset the impact on timber production from increased environmental demands (Binkley 1997, Sahajananthan et al. 1998, Ontario Ministry of Natural Resources 1999). Forest management zoning has also been implemented in the New South Wales State Forests in Australia where each zone has an activities table to provide guidance for forest management: 'Activities Not Permitted', 'Activities Permitted with Standard Conditions' and 'Activities Permitted with Special Conditions' (Sanders et al., undated). Zoning concepts are easy to understand and, once accepted, provide an immediate practical basis for management.

An advantage of a zoning approach in the spatial segregation of types of land-use based on specific sets of rules and regulations in a simple and straight forward implementation. A disadvantage is the large scale entrenchment of these sets of rules and regulations which prevents flexible adaptation to changing circumstances. Thus, zoning may also be seen as a somewhat simplistic response to a conservation conflict because it limits the range of options and prevents continuous adaptation to changing public demands and changing environmental conditions. The spatial segregation of different types of land-use prevents small scale spatial mixing of different management options. An example is the simplistic rule that harvesting of stands older than 100 years is not allowed.

Small-scale spatial mixing of different options, based on new pragmatic theories, may eventually turn out to be preferable in generating a continuously evolving landscape in response to human demand and changing environmental conditions.

3.2 Small-Scale Spatial Mixing

Haber (2004) proposes a conscious spatially and temporally differentiated energy input into the diverse land-use units within a landscape. Tress and Tress (2001) present a similar, transdisciplinary systems approach to landscape where the role of humans in the people–landscape interaction proceeds in mutually influencing loops of actions and reactions. Within a landscape context, it should be possible to reach a negotiated outcome, a scenario that considers different needs and achieves a range of environmental and socio-economic goods and services (Aldrich et al., 2004). This can be achieved using a pragmatic concept such as the "Multiple Path Design" (Gadow et al., 2007) which aims to integrate all discipline-specific know-how, the particular preferences of all *bona fide* stakeholders, and emprical observations about ecosystem dynamics.

Traditional forest inventory plots are often too small to capture scale-dependent phenomena such as species–habitat associations (Kenfack et al. 2014), or maximum density patterns (Zhang et al. 2015). For this reason, there is a growing tendency to establish large contiguous field plots (*Observational Studies*) which are remeasured over long time periods (Gadow et al., 2016). A number of study sites, including several smaller plots and transects, and a large observational block (compartment 256), have already been observed since the 1950's in Bialowieza. **Additional permanent observational studies with mapped trees, as well as control plots for assessing the browsing pressure of large herbivores, would constitute a sound empirical basis for policy formation.**

Observations covering the entire lifespan of a forest tree are rare. Therefore, models have become indispensable for simulating forest dynamics. The degree of model resolution depends on available observations and on the use of the model. For this reason, the "telescope" type models which integrate community and individual tree growth are especially relevant (see example by Hevia et al., 2015). **New forest models have also been developed by the Department of Silviculture at the University of Life Sciences in Warsaw.** Forest models provide key information about the dynamics of the tangible characteristics of a forest. In addition, forest models can be useful in evaluating less tangible phenomena, such as the stability and resilience of an environment affected by industrial pollution, the aesthetic value of a given forest structure, or the spread of a bark beetle gradation (Wermelinger, 2004).

Compartments are the primary units of spatial organisation, resource assessment and bookkeeping. The original subdivision of Bialowieza reveals a schematic pattern that was probably imposed during the early years of organized forestry (Brincken, 1824; Hedemann, 1939). That subdivision into Quartals (covering 1066.78m square), which is ineffective for site-specific planning, has been complemented by the Directorate of Forestry with an additional site-specific GIS system which includes digital maps and multiple-level databases. This database represents a very important technical aid for policy formation and planning.

The development of a compartment follows a succession of management events, including conscious "No Action" decisions. Each event has an effect on the ecosystem services provided. This spatial reality facilitates the transfer of scientific expertise into practical management. A *management path* may be defined as a particular set of management activities in a specific spatial unit and within a particular time window, - referring to a limited period of time during which developments can be predicted using models of tree growth (Pretzsch, 2001; Álvarez-González et al., 2009; Sims et al., 2009), or models of bark beetle infestations and associated effects (Jurc et al., 2006; Seidl et al., 2007; Jönsson et al., 2011; Fahse and Heurich, 2011).

New technology facilitates the simulation of several possible *management paths* for each individual compartment. The number of paths depend on specific constraints which may be imposed by the Forest Act, the Act on Nature Protection, Natura 2000 or UNESCO World Heritage requirements. Each management path is associated with a utility U which can be estimated using an additive function (e.g. Keeney and Raiffa 1993), e.g.

$$U = w_1 u_1(D) + w_2 u_2(M) + w_3 u_3(C) + w_4 u_4(M) \quad (1)$$

where w_1 , ... w_4 are the weights describing the relative importance of mushroom yield (M) species diversity (D) carbon balance (C) and recreation value (R), for example. The corresponding functions $u_1(D)$, $u_2(M)$, $u_3(C)$ and $u_4(R)$ measure the perceived utility of the different products (D, M) and services (C, R). The partial utility functions can be derived using continuous statistical models (e.g. Alho et al. 2001, Leskinen et al. 2003). A range of relevant criteria like nutrient balance, fire risk and soil protection were proposed by Spellmann et. al. (2001) to demonstrate that integrative approaches are needed to maintain forest ecosystem integrity. Following a proposal made by Pukkala and Kangas (1993), the utility of a specific path combination within a forested landscape may be determined as follows :

$$Maximize\ \mathbb{U} = \sum_{i=1}^{n} w_i \cdot u_i(q_i) \quad (2)$$

where U=utility for a given path combination; n=number of products/services; w_i =relative weight of products/service i $\left(0 \le w_i \le 1; \sum_{i=1}^{n} w_i = 1\right)$; q_i =realized amount of service i for a given path combination; and $u_i(q_i)$ =partial utility function for service i $\left(0 \le u_i(q_i) \le 1\right)$. A *multiple path design* represents a specific combination of *management paths* for all the different spatial entities within the landscape.

The aggregated mix of services over all spatial units and management paths provides a useful basis for conflict resolution. A discrete number of management paths are generated for a given set of spatial units and each path is associated with a vector of inputs and outputs over time. The general theory, which has been described as the *Multiple Path* concept (Gadow et al., 2007), could provide long-term solutions for conservation conflicts. The multiple path concept has already proved its worth in large-scale practical applications (Nuutinen et al., 2000; Kangas et al., 2001; Pukkala, 2004; Pykäläinen et al., 2007). Numerous tools have been developed during the past 30 years to facilitate the realistic implementation of the theory, including better models of tree growth (Hynynen et al., 2002; Nagel, 2001; Pretzsch, 2001, Hevia et al., 2015), more effective algorithms that translate silvicultural prescriptions into tree selection algorithms and complex forest structural modifications (Albert, 1999; Hessenmöller, 2002) and more effective methods to identify the preference structure of forest owners and other decision makers with regard to certain forest services (Leskinen, 2001).

Landscape planning should be effective in linking the local and global levels of the spatial hierarchy. The *Monsu* planning system has been especially successful in implementing such a non-trivial approach (Pukkala, 2004). **Zoning may present a first feasible solution in solving the conflict; but small-scale spatial mixing of different options, based on a pragmatic concept, may eventually turn out to be preferable in generating a continuously evolving landscape in response to human demand and changing environmental**

conditions.

4 Conclusions

Spruce Bark Beetle: Spruce Bark Beetle gradations are a common phenomenon in European national parks. The effects on ecosystem processes have been studied extensively and are well known. There is no need to collect further evidence. Continued and timely salvaging of infected trees would lower the fire risk, reduce carbon dioxide emissions and restore ecosystem integrity. **This is not primarily a question of management, but requires the political will to act.**

Subdivision: The historical forest subdivision into rectangular blocks (verst square) represents a useful spatial basis, but disregards natural site features. **A site-specific subdivision, as implemented by the State Forestry Directorate** in a complex GIS system with digital maps and multiple-level databases, creates an effective basis for spatially explicit planning and decision-making and facilitates the implementation of existing, spatially relevant legal and administrative restrictions in silvicultural planning.

Design: Landscape design benefits when different management options are **integrated**. Conflicts may result when these aims are pursued separately. **Coordinating the design of the entire Bialowieza Forest landscape will provide a desirable mix of services and products for society.**

Large Herbivores: The populations of large herbivores in the Bialowieza National Park need to be controlled to prevent further deterioration of diversity. Fenced control plots will permit an objective evaluation of browsing effects on tree community structures in the park.

Showcase Model: Bialowieza could become **a showcase model of a negotiated landscape design** where a range of environmental and socio-economic goods and services are provided. The realisation of this ideal is possible if management is based on a negotiated spatial mix of different management paths. The result is a dynamic landscape characterized by a mix of habitats, high species diversity and resilient ecosystems.

5 Literature

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Białowieża Primeval Forest:

Management Action under Conflicting Ecological Paradigms

An Assessment Report of the Białowieża Study Tour
August 1 – 4, 2016

Prepared for the Chancellery of the Prime Minister of Poland

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Background

The Białowieża Primeval Forest (BPF) is facing severe forest degradation, particularly in Norway spruce (*Picea abies*) and to a lesser degree in Scots pine (*Pinus sylvestris*) and other species, due to a rapid increase in the levels of mortality due to an infestation of European spruce bark beetle (*Ips typographus*). The *Ips* has been present in Białowieża for many years. Prior to 2011, the spread of the *Ips* appears to have been minimized by the sanitation harvesting of infected trees (Figure 1). In 2011, the Minister of Environment, under pressure from external groups, severely limited the volume of infected spruce that could be harvested. Since 2012, the numbers of trees infected and killed by the *Ips* has almost quadrupled annually (Figure 1). The infestation primarily has spread throughout the Białowieża Forest District and the Białowieża National Park, while the infestation has not yet reached such elevated levels in the Browsk and Hajnówka Forest Districts. Forest directors and forest scientists have called upon the National Forest Director and the Minister of Environment to allow increased logging of infected trees to once again contain the spread of the *Ips* and thus reduce further forest degradation. Announcements of harvest plans in spring 2016 resulted in an outcry by those opposed to any cutting in the BPF. Environmental opposition, strengthen by restrictions imposed by external agencies such as UNESCO World Heritage and Natura 2000, have restricted the local foresters' authority to intervene and eliminated the tools they have historically used to control *Ips* in the BPF. Thus, the apparent crisis depicted in Figure 1 has been precipitated by conflicting management ideologies.

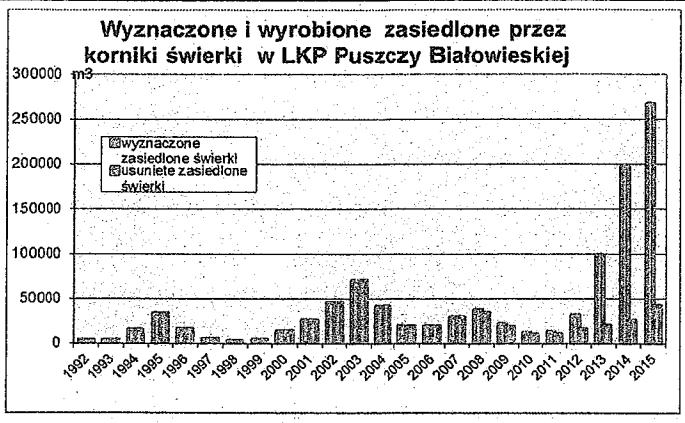

Figure 1. Cubic meters of infected and sanitation harvested trees in Białowieża Forest from 1992 to 2015. (slide from presentation of August 2, 2016, Białowieża Forest District)

Between August 1 – 3, 2016, a team of forest scientists from Germany, the USA, and Canada were brought to Poland for a study tour of the BPF and to consult with various interest groups. We were each asked to submit an individual report giving our assessment of the situation and recommendations. This report represents my submission, and is based on: 1) observations made during the field portion of the tour; 2) discussions with Polish scientist during and after the field tour; 3) discussions with BPF foresters and local government officials; 4) historical and current literature related to the BPF; 5) literature related to forest management, conservation, ecology, environmental conflict, and environmental sociology; and 6) personal experience.

The Białowieża Primeval Forest

Białowieża Primeval Forest. No other place in Europe, and perhaps no other place in the world, invokes such vivid imagery as does the Białowieża Primeval Forest (Schama 1995). For many, the Białowieża Primeval Forest (BPF) is an image of Europe from an age passed. The private hunting grounds of a long list of Royalty. Peasant communities living in harmony with nature. The source of nationalistic pride and identity. The wellspring of resistance to invading armies. A forest, primeval.

For me, personally, the appeal of being a member of this scientific study tour was the chance to visit the BPF. It was a highlight of my career as a forester, and an honor to be invited. Not because I was visiting a wilderness, untouched by humans, but because I was visiting place shaped by human history and human hands, a place that has represented the very struggle for identity – individual, national, and perhaps even continental or global. While maybe not the birth place of modern forest management, it is certainly one of its life-sources. Some of the earliest known statistical surveys of forest resources were conducted in the BPF in the late 1700s. Notably, the first known forestry publication by a female forester, Anna Jablonowska Sapieha, came from the BPF during this same period (as cited by Schama 1995). One of the earliest cited yield tables I have found is from the BPF dating to the late 1780s. As a forest mensurationist interested in the history of forestry, the BPF holds a mystic appeal, professional pride, and a sense of reverence.

These feelings are not unique to me. In the first part of Simon Schama's (1995) "*Landscape and Memory*" - entitled **Wood** - the first chapter is devoted to the BPF[1]. Schama writes a compelling saga of how gamekeepers and foresters shaped the landscape, both physically and politically, as national borders were drawn and redrawn to reflect the truces and pacts formulated to end the conflict of the day. The primeval forest, the royal hunting grounds, and the bison are all nationalistic symbols that placed BPF in the hearts of Poland for generations (Schama 1995; Franklin 2002; Blavascunas 2012; Sunseri 2012). Since1989, these same symbols are being exploited by crisis environmentalists (Franklin 2002) to save the BPF from the "evil foresters" (Franklin 2002; Blavascunas 2012).

To the modern crisis environmentalist, the primeval forest is an undisturbed landscape free of human interference, a prehistoric remnant where plants and animals coexist, where nature knows best, persisting forever as it once was (Sunseri 2012). One does not have to search too hard to see that this is the current view used by crisis environmentalists to stir emotions and gain support to "save" BPF (Blavascunas 2012). For example, The Guardian reports on May 25, 2016 of Poland's plan to start logging the primeval Białowieża forest.[2] In this article, Greenpeace Poland activist Katarzyna Jagiełło, warns that the logging will destroy an ecosystem untouched for 10,000 years. In another article dated May 18, 2016, the logging is portrayed as an "environmental coup".[3] And on April 3, 2016, Patrick Barkham pleads for the EU to step in and save Europe's most precious forest.[4] In all of these stories, and many more, common themes

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[1] This was actually my first introduction to the Białowieża Primeval Forest

[2] https://www.theguardian.com/world/2016/may/25/poland-starts-logging-primeval-bialowieza-forest-despite-protests

[3] https://www.theguardian.com/environment/2016/may/18/last-stand-for-europes-remaining-ancient-forest-as-loggers-prepare-to-move-in-bialowieza

[4] https://www.theguardian.com/commentisfree/2016/apr/03/poland-europe-bialowieza-forest-eu

emerge: Europe's tallest trees; Europe's largest mammal; a tree canopy that extends for a thousand kilometers across Poland and Belarus; home to 20,000 species; etc. All offered as proof that BPF is an untouched virgin forest, and all offered as proof that the planned logging will cause harm that will take centuries to recover from.

This perception of primeval forest is a relatively new construct of the crisis environmentalists often used as a call to arms to save some "threatened" landscape from intruders, usually loggers, local indigenous people, ranchers, or hunters (Sunseri 2012). Throughout much of Europe's colonial history, and perhaps even longer, the concept of the primeval forest has been more aligned with the German construct of the Ürwald: the 'primeval forest' was an undeveloped, often uneconomic, landscape inhabited by poor, primitive, uneducated people who needed the State and Western Science to exert a firm hand in order to bring them civilization and modernity" (Franklin 2002; Sunseri 2012). Both views, in reality, are simply justifications for dispossession of local interests (Westoby 1987; Gibson et al. 2000; Blavascunas 2012; Sunseri 2012).

The Białowieża Primeval Forest (BPF) is a remnant of the lowland forests that once covered much of the central European lowland plains (Falinski 1986). In the 14th century, the BPF became the royal woodlands of the Jagiellonian kings (Samojlik 2005). While sovereignty over the BPF has shifted many times over the last 600+ years, the BPF largely remained the reserved hunting grounds of the current ruling class (Schama 1995). As a result, the BPF is one of the few lowland forests in Europe that has never been completely cleared of forest cover (Pabian and Jaroszewicz 2009).

While the modern crisis environmentalists have chosen to interpret this to mean that the BPF has been untouched (Franklin 2002), nothing could be further from the truth. One only has to examine the geography of the BPF to understand that the forest must have had use by humans for centuries. The existence of navigable rivers through the forest (Figure 2) that connect to the Vistula River and the Baltic Sea would have provided a means of transporting forest products (Brinken 1828; Hedemann 1939; Schama 1995). As early as 1410, the rivers of the BPF were noted for their transportation use[5]. Julius Brinken (1828, pp. 94 - 95) also noted the economic importance of the rivers of the BPF.

Figure 2. Rivers of the Polish Białowieża Primeval Forest (By Krzysztof Maria Różański, (Upior polnocy) - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=9648482)

[5] In the winter prior to the Battle of Grunwald, Władysław Jagiełło ordered a great hunt in the BPF to stockpile meat which was floated down the Narewka to the Narew and on to the Vistula to Plock (http://www.historytoday.com/richard-cavendish/battle-grunwald).

The historical memoire by Julius Brinken (1828), "*Mémoire descriptif sur la forêt impériale de Białowieża en Lithuanie*" (A Brief Description of the Imperial Białowieża Forest in Lithuania) provides a detailed description of the BPF in the early 1800s, including geography, forest vegetation, animals, and administration. According to Brinken forest products were one of the largest contributors to the local economy (Brinken 1828, pg 93). His detailed descriptions of the forest conditions, including sizes and volumes by species (see Brinken 1828 pg 33) suggests that an fairly detailed inventory of the forest must have been available. His later description of forest administration (see Brinken 1828 pg 93 - 97) confirms the existence of forest administration units, a head forester, several huntsman, and 13 rangers. Additional information on the game population, the presence of fire in the forest and its use and control, and a detailed description of a hunt all paint a picture of a forest managed by humans. Hedemann's (1939) "*L'histoire de la foret de Bialowieza jusqu'a 1798*" (The history of the Forest of Białowieza before 1798) provides additional documents and information regarding human activities, including forest management, prior to the Third Partitioning of Poland. Of particular importance in this work is a map from 1639 showing the boundaries of apparent forest compartments.

In more modern literature, Falinski (1986) estimates that as much as 90% of the BPF shows traces of human activities. Extensive evidence of charcoal and wood-tar production in the BPF during the 18th-century was reported by Samojlik et al. (2013). Sokolowski (1999) describes how the geometric system of roads through BPF provided access and resulted in increased harvesting and replanting since they were constructed in the late 18th and early 19th centuries. Samojlik et al. (2016) describe how the implementation of modern forest management altered and eventually eliminated the traditional practice of open cattle grazing on the BPF. Both Schama (1995) and Samojlik et al. (2003) use historic paintings to describe a forest landscape heavily influenced by human activities, especially associate with hunting and game management. Brinken (1828) also included artwork to support his descriptions regarding the nature of the Białowieza landscape.

Perhaps the single greatest human impact on the BPF has been the maintenance of high populations of large herbivores for royal hunting. Based on historical records of hunts and wildlife statistics, Jędrzejewska et al. (1997) estimate average annual densities of between 2.0 and 14.4 animals/km^2 from 1798 and 1993[6]. Cattle grazing was also common practice in much of the BPF (Jędrzejewska et al. 1997; Samojlik et al. 2016). Differential browsing of species would have had a large impact on species composition, favoring pine, spruce, and hornbeam over the preferred oak, lime, alder and other preferred species. In addition to direct consumption, fire probably was used to enhance browse for game species (Brinken 1828). Niklasson et al. (2010) document a substantial increase in fire frequency starting in 1653 until about 1781 after which the fire frequency decreased dramatically. The use of fire as a game management tool has been well document in many places around the world (Botkin 1990; Pyne 2001, 2012). Changes in

[6] This equates to about 65 to 1180 kg of crude animal biomass/km^2. Kuzyk and Hudson (2007) estimate that ungulates consume about 3% of their body weight daily, this would equate to 700 to 13,000 kg/km^2 of forage annually. Kuzyk and Hudson (2007) also estimate that 60% - 80% of the forage comes from woody vegetation, assuming the lower bound and that 50% of the woody biomass is from tree species, this would produce an estimate of 840 – 15,600 250g tree seedlings consumed per km^2 per year.

fire frequency in the BPF correspond well with the time line for implementation of modern forest management (Samojlik et al. 2016).

Based on the evidence available, it can be concluded that the **Białowieża Primeval Forest is not a primeval forest**. At least not in the context used by modern-day, crisis environmentalists, that is, a remnant, untouched wilderness requiring protection from human interference. It is a cultural landscape (Schama 1995) rich in a history of human experience.

Adaptive Management, Conservation, and Economics

What is natural? This questions has plagued philosophers and scientists for millennia. Attempts at answering that question has led to faulty assumptions, incorrect hypotheses, and counterproductive policies (Botkin 1990; Wagner 1995; Lackey 1999). Henry David Thoreau (1887) in "*The succession of forest trees, and wild apples*" introduced the concept (or at least the term) "succession" to explain the observed changes in vegetation he observed over several years of wandering the New England landscape. Cowles (1911), Clements (1916), and Gleason (1926, 1939) codified this concept into the North American ecological literature and set in motion the development of a paradigm[7] that still dominates much of ecological thought and associated philosophies regarding biological conservation and management of biological "reserves" (Botkin 1990; Keigley and Wagner 1998). The basic assumption of those whom adhere to the theory of succession and climax is that if we leave "nature" alone long enough it will return to some equilibrium, steady state (ie, climax) representing the vegetation that is "supposed to be there" and a balance of nature will be achieved. This may be true in the absence of exogenous disturbances and fluctuating climate; however, these are the norm rather than the exception (Botkin 1990; Sprugel 1991; Oliver and Larson 1996). In the presence of these factors, Sprugel (1991) argues that it is meaningless to speak of "natural" since the vegetation and the organisms it supports will be constantly adjusting to the new "norm".

Despite this reality, many crisis environmentalists, including scientists whom hold to the paradigm of "the balance of nature", still advocate that the only way to preserve/conserve ecosystem function and biodiversity is through a strict "hands off" approach (Botkin 1990; Wagner 1995; Bormann et al. 1999; Lackey 1999). This "do nothing" approach implies that "nature knows best". This viewpoint has certainly been expressed in attitudes regarding the bark beetle outbreak in the BPF. During my discussions with, and readings of, scientists and managers holding a "no action" viewpoint, phrases like: "the bark beetle is curing the BPF of spruce," "we are stopping the human cancer that has plagued BPF," or "whatever happens, happens, nature know best." **However, nature "knows" nothing, nature is not an all-knowing, sentient being.** "Nature" is a collection of individual organisms competing (both intraspecific and interspecific) for limited resources, driven by survival of the fittest and frequently perturbed by random events.

A balance of nature does not exist, and probably never has existed (Elton 1930). As Botkin (1990) says, "Whenever we seek to find constancy, we find change." Schama (1995) argues that we should acknowledge that it is our shaping perception that makes a landscape, and we must

[7] As used by Kuhn (1962) "*The Structure of Scientific Revolutions*"

acknowledge that the impact of humans on the earth's ecology has not been an "unrelieved and predetermined calamity", but rather a long relationship between nature and culture.

Drawing a line around an area of interest, or choosing some arbitrary stage of development or age, and declaring "Thou shalt not touch" is not protection. In an extreme example, Figure 3 shows protection. The intensive breeding program to maintain the bison herd, the culling and moving of individuals, and winter feeding also represent examples of protection. We must recognize that the decision to "do nothing" is a management action (Leopold 1933). **When we are deciding to protect something, we must ask what are we protecting? A place? A process? A forest structure? An ideal?** Like it or not, all decisions in the BPF, whether they are decisions regarding the Białowieski Park Narodowy or one of the three forest districts, are management decisions. Good management decisions require good data and clearly articulated goals, objectives, actions, measureable criteria, and acceptable outcomes (Baskerville 1985, 1986). The do nothing action will produce outcomes, some of which we may like and many of which we will not like; without goals, objectives, measureable criteria, and some understanding of the bounds of acceptability, we have no way of judging the goodness of our management actions. **Without these in place, the do nothing action becomes an interesting, but unfortunately unreplicated (and potentially disastrous), experiment.**

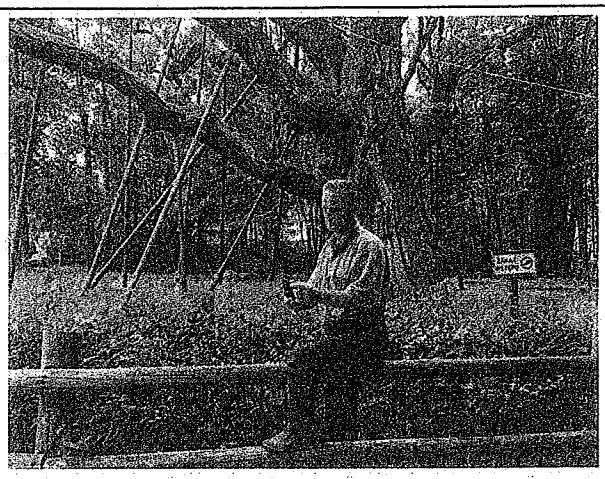

Figure 3. The "Bartek" oak. Props supporting heavy branches and concrete stabilizing the trunk demonstrate the levels of protection attempted to preserve this historic landmark of Poland.

The widespread *Ips* outbreak in the BPF can certainly be viewed as an unanticipated outcome[8]. Similar outbreaks have been observed elsewhere in Europe where "protection" has been imposed (von Ruschkowski and Mayer 2011; Stadelmann et al. 2013). The social and economic acceptability of these outcomes of a do nothing action must be questioned. In response to these situations, and many similar situations around the world, many scientists and managers have called for an adaptive ecosystem management approach (Wagner 1995; Bormann et al. 1999; Eastwood 2014).

[8] Unanticipated may not be the right word, when describing the situation with Dr. Steven Heard, an evolutionary entomologist at University of New Brunswick, he immediately sensed the problem when I was discussing this report with him.

Adaptive management is a "learning by doing" process (Walters 1986; Lee 1993). Adaptive management considers both management actions and the policies that limit them as experiments to learn from. Sustainable ecosystem management is ideally suited to the philosophy of adaptive management (Lee 1993; Bormann et al. 1999). Adaptive management acknowledges the importance of human needs while at the same time confronting the reality that the capacity of our world to meet those needs in perpetuity has limits and depends on the function of ecosystems (Christensen et al. 1996). Adaptive ecosystem management is not a rejection of the anthropocentric for a totally biocentric world view (Christensen et al. 1996), and there is no requirement to include management for biodiversity, ecosystem health and integrity, and commodity production in every management decision (Wagner 1995); however, there must be mechanisms in place to provide the feedback in order to learn and adapt policy and management actions to what we have learned. **The restrictive regulations imposed upon the BPF do not provide mechanisms for adaptive management and only one experimental action, the do nothing action, has been allowed.** Rational ecological planning needs a measure of flexibility simply because ecosystems are dynamic, if the naturalness of change is not taken into account, those plans are doomed to failure in one way or another (Botkin 1990; Lee 1993; Bormann et al. 1999).

Bormann et al. (1999) advocate that new citizen-manager-scientist partnerships are essential to learn to achieve sustainable ecosystems. Other than the potential for increased economic benefits due to tourism (Pabian and Jaroszewicz 2009), the restrictive regulations imposed by Natura 2000 and other agencies have largely ignored the local population of the BPF. During our study tour we had an opportunity to speak with several representatives of the local governments. They feel dispossessed and ignored. Regulations have resulted in local employment losses due to less timber available for local mills. Local residents have had to switch to buying low grade coal for heating their homes because there is not sufficient firewood available. Given the global concern over climatic effects of fossil fuel use, it seems silly to be exchanging firewood which represents short-term (60 – 200 years) carbon storage for coal which represents much longer term (200+ million years) carbon storage. In an adaptive management framework, such effects would be incorporated into the management learning cycle.

Economics is also an important aspect of sustainable ecosystem management (Christensen et al. 1996; Bormann et al. 1999). Increased restrictions on forest management via policy regulations such as those imposed by Natura 2000 has resulted in a reduction of timber supply throughout Europe, yet demand for wood has continued to increase. During the first decade of the 21st century, Germany went from being a net exporter of timber to a net importer of timber. Reductions of timber from public lands results in increased demands on private lands and importing timber from countries with less restrictive policies. Shifting the ecosystem impacts to somewhere else does not result in sustainable management.

Recommendations

In developing this report, it has been astonishing to discover the amount of materials written about the Białowieża Primeval Forest and the current controversies. Franklin (2002) identifies four recurring myths in the modern discourse about the management of BPF: (1)

Poland's and Europe's `last primeval forest'; (2) Royal or noble hunting - a test of bravery; (3) Polish resilience and defiance symbolised by the mighty and venerable wild European bison; and finally, (4) Białowieża, the dying forest that is being destroyed by demonic foresters and needs to be protected as a National Park. Blavascunas (2012) argues that crisis environmentalists have used these myths since 1989 to dispossess locals and to dismiss the centuries of accumulated professional forestry knowledge. However, while these myths certainly have been exploited, I would be hesitant to dismiss them or ignore them, after all, these are what makes the BPF such a special place (Schama 1995).

1) **The current *Ips* outbreak is not natural and immediate action is required to slow the spread**

The existing forest structure in the Białowieża Primeval Forest is the result of several hundred years of forest management (both conscience and unconscience). This forest exists today within the context of a domesticated landscape, and the boundaries designating Białowieża are the arbitrary results of years of human influence. Even though the insect is native, the tree species are native, and the two have evolved together, one must ask the questions: "Given the history of human activity in Białowieża, the cultural and management practices, and the resulting stand structures, how natural is the current infestation? Sustainability relies on the continuity of both the ecosystem and the human systems dependent upon them (Botkin 1990; Lee 1993; Wagner 1995; Bormann et al. 1999). Prior to 2011, the *Ips* in the BPF was managed under a continuous sanitation harvest system, and big trees were grown, 100 year old trees existed, and the forest was even perceived to be untouched. The sanitation harvests provided protection, removal of them as a management tool has produced a rapid and disastrous increase in infestation and subsequent mortality (Figure 1). From an adaptive management perspective, we have two experiments and two outcomes: What have we learned? The spruce mortality represents a great loss both economically and aesthetically. Is this the end of the BPF? No, there will be a forest to replace the dying spruce. But, is this the best use of the forest for all involved? I do not think so, and recommend immediate action to reduce the spread of *Ips*, restore timber supply to the local economy, and recover whatever value there might be in the dead and dying spruce.

2) **Develop an adaptive management approach that includes citizen-manager-scientist partnerships**

The crisis environmentalists have used the myths associated with the BPF to dispossess the local citizens and to discredit and even vilify the forest managers (Franklin 2002; Blavascunas 2012). Creative solutions often arise from interactions of diverse groups (Schön 1990). Both the Park and the Forest Districts should be included in the adaptive management process. Neither are self-contained systems, interacting independent of one another. Both need clear management goals, measureable criteria, and desired outcomes (Wagner 1995) and these should be developed by the citizen-manager-scientist partnership. Reactive learning, such as recommendation #1 addresses, is neither economically nor ecologically efficient, and should not be considered socially acceptable. Effective learning and adapting must be central

to all involved, and the learning must be multidirectional, not just from the scientist → manager → citizen.

3) **Document the impacts of ungulates on the forest structure**

The BPF has been a game preserve for most of the last 600 years. Current populations are near the levels prior to World War One (Jędrzejewska et al. 1997). Heavy browsing is likely a continuing influence on stand structure and species composition in the BPF (Figure 4). Fencing

Figure 4. Partial panorama showing area fenced to the left and area left unfenced. While this does not directly test the hypothesis of heavy browsing by ungulates, the fencing structure would have only excluded those species. (Photo taken by Kershaw, August 2, 2016).

has long been used in places where ungulate browsing is a factor (Smith et al. 1997). As seen in Figure 4, there is a dramatic difference in vegetation abundance and, most likely, composition. The prevalence of browsing and its effects on species composition is an important aspect in the management of the BPF and needs more sufficient documentation.

4) **A clearer distinction between the Białowieski Park Narodowy and the three Forest Districts**

Today the BPF is split between the countries of Belarus and Poland. On the Belarus side, the forest is protected as the Belovezhskaya Pushcha National Park with an area of 1,771 km^2. On the Polish side the BPF is divided into the Białowieski Park Narodowy (105 km^2) and three Forest Districts: the Bialowieza Forest District (126 km^2), the Browsk Forest District (204 km^2), and the Hajnówka Forest District (197 km^2). Many people are surprised and even shocked when they learn that the whole BPF is not a national park. Differences in objectives, management, acceptable uses, and extraction of forest products need to be highlighted and explained to the general public. The role of forest management in maintaining the BPF needs to be showcased. These can be accomplished in a variety of ways including signage, promotional pamphlets, and educational programs.

5) **Celebrate man in the Primeval Forest**

The BPF is a cultural landscape, this is what makes it such a special place that instills such passion. Nature does not exist apart from man (Leopold 1933; Botkin 1990) nor does landscape (Schama 1995). The European Environment Agency (EEA) recognizes that European landscapes reflect not only the continent's diverse climate and geology but also centuries of

interaction between man and nature[9]. Elsewhere in Europe the "Ancient Woodland" concept has been advocated as a means of conservation and landscape restoration (Goldberg et al. 2007; Müllerová et al. 2014). All dimensions of the European landscape need to be considered[10]. An adaptive management strategy is far more likely to achieve this than a "do nothing" regulatory dictate. It is pointless to argue what is natural (Sprugel 1991), and the widespread application of the "do nothing" action in the long run only preserves an ideal.

It is in vain to dream of a wildness, distant from ourselves.
There is none such. It is the bog in our brains and bowels,
the primitive vigor of Nature in us, that inspires that dream.
I shall never find in the wilds of Labrador any greater wildness
than in some recess of Concord , i.e. than I import in to it.

Henry David Thoreau,
Journal, August 30, 1856

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[9] http://www.eea.europa.eu/highlights/protecting-europe2019s-cultural-landscapes-and

[10] http://www.coe.int/en/web/landscape/home

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Comments on the Management of the Białowieża Puszcza Forest Region in Poland

Dr. Patrick Moore
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September, 2016

The author of these comments, Dr. Patrick Moore, holds a Combined Honours B.Sc. in Forest Biology and Biology, and a Ph.D. in Ecology with a focus on Forest Ecology. He was one of the Co-Founders of Greenpeace in 1971 and served in the top committee for 15 years, the last seven years as one of six Directors of Greenpeace International. Dr. Moore has been an independent ecologist and environmentalist for more than 45 years. From 1991-2002 he was Chair of the Sustainable Forestry Committee of the Forest Alliance of BC, a high-level process that developed the 21 Principles of Sustainable Forestry (attached), which were adopted by a majority of the industry. Dr. Moore has presented his views to numerous governments including the EU Parliament and the US Senate.

Below are the comments that Dr. Moore would like to share with the people and government of Poland, regarding the management of the Bialowieza Forest Region:

The two most important facts about forests are:

1. Forests are home to the majority of the world's terrestrial species of animals, insects, invertebrates and plants. Without forests many of these species simply could not exist.

2. Forests provide by far the most important renewable energy and material resource for human civilization, wood. To obtain wood, trees must be harvested and processed.

These two facts are often portrayed as if they automatically in conflict with each other but they are not. They are mutually compatible so long as a balanced approach is applied to forest management policy.

As European civilizations grew larger, and before fossil fuels became the dominant energy source, wood was used for heating buildings, glass making, metal smelting, and eventually for firing steam engines. By 1700 the forests in Europe had been reduced to less than 10% of the total land area. There was no longer enough forest to sustain the population's

demands. Then two dramatic changes occurred. First, and for the first time in history, people learned to apply farming methods to renewing forests in denuded regions. The science and art of silviculture was born in Central Europe, as necessity became the mother of invention. While tree-fruit and ornamental-tree horticulture have a long history, the practice of growing trees commercially for wood is a very recent development. Second, fossil fuels, first coal, then oil, and finally natural gas began to replace most of the energy requirements that wood had provided for centuries. Today the forest area of Europe is well in excess of 30% due to the application of sustainable forest management.

When a forest is permanently removed, such as in clearing forests for agriculture or cities (deforestation) the habitat for many species is lost and they will disappear from those landscapes. But when forests are replanted and allowed to recover (reforestation), they can continue to provide habitat for forest species, while at the same time providing a sustainable supply of wood for energy, timber for building, and paper for printing, packaging, and sanitary products. In other words, unlike many uses of the land, sustainable forestry has the benefit of maintaining species habitat while simultaneously supporting an important part of the economy and supplying a renewable resource for the people.

By far the main driving force behind the development of silviculture and the expansion of European forests was the demand for wood. It is the demand for wood that prevents the continued deforestation of the land.

There is a common belief that when we buy wood we are causing a bit of forest to be lost somewhere. But the opposite is the case. When we buy wood we send a signal into the marketplace to plant more trees and provide for the demand for wood. Thus the correct policy for maintaining forests on the landscape is to grow more trees and use more wood sustainably.

People and trees have co-existed for centuries in the Bialowieza Forest Region. This alone should demonstrate that the use of trees for wood is not a threat to the forest, so long as professional management ensures a sustainable harvest.

Dr. Chris J. Cieszewski has provided a lengthy discussion of the word "natural" in his report. I agree with his assertions. But in many ways it is much simpler than that. Everything that exists and every change that occurs is natural. The only things that are not natural are fictions and fantasies.

The words "natural" and "unnatural" are not opposites as it may appear. "Natural" refers to all of nature, *including humans,* and is an all-inclusive word virtually meaning "everything that is". "Unnatural", however, is a moral judgment as in "unnatural acts" such as incest, rape, and murder. The use of wood from trees is obviously not immoral.

Of course it is desirable to have some forests protected as parks, wilderness, and recreational areas. The 1987 publication *Our Common Future,* also known as the *Brundtland Report,* by the UN Commission on Environment and Development proposed that 12% of the world's land area, based on ecosystem classification, should be protected from commercial

development. My province of British Columbia in Canada succeeded in more than doubling it's protected area from 6% to slightly more than 12% during the 1990s. But once this was achieved the real question became, "How do we manage the remaining 88% of the land."

Of all the uses of land for the provision of resources, sustainable forestry, especially when native species of trees are grown, has the least impact on biodiversity. Agriculture requires virtual elimination of the original species and replacement with a monoculture, usually of a non-native species. Urban development does contain trees and other plants but is far different than a native forest. Industrial development for factories effectively paves over the land permanently. In forest management the native herbs, shrubs, most species of animals, birds, insects, and invertebrates can continue to occupy the land. Forest management for the provision of wood is *the* most sustainable and renewable industry practiced by humans. And yet many people are more comfortable with farm fields planted with exotic crops than they are with forestry.

In my book, *Trees are the Answer,* I include a chapter titled *The Aesthetics of Comparative Landscapes.* I compare a scene of a recently harvested forest with the scene of an area of pastureland surrounded by forest. Most people do not like the appearance of a recently harvested forest, as it looks messy and "destroyed". But in forest management a new forest will be established there and within a few years it will look beautiful and healthy. The pasture, on the other hand, is a permanently deforested area with very little biodiversity, and likely a herd of exotic domestic animals such as sheep living there. Yet the pasture looks lovely to most people. This is an example of judging landscapes by their aesthetic appeal rather than by their biodiversity and ecosystem health. We should not be tricked by the use of snapshots in time to convince us that forestry is undesirable.

There is a big difference between what is "natural", and what is "desirable". Clearly an infestation of bark beetles that kill huge numbers of trees is a natural phenomenon that occurs when a certain combination of environmental factors arise. But it is among the most undesirable outcome in a forest that is managed for wood production. Perhaps the only worse outcome is a massive forest fire. It is not possible to control a bark beetle infestation with chemical pesticides as the beetles are under the bark where they can't be sprayed. There is only one effective strategy for managing such a plague without wasting the trees that die. The trees must be cut while they still have economic value and new trees must be planted using some of the money gained by harvesting the infected trees.

In British Columbia we call this "chasing beetles". Under normal circumstances the timber is harvested sustainably according to a five-year plan. But in the event of a massive outbreak of bark beetles the five-year plan is shelved and the focus becomes following the outbreak and cutting the trees as they become infected, preferably before they die and while they still have economic value. In this way there are fewer infected trees in the landscape so eventually the beetle infestation can be brought under control. New trees are planted quickly so the interruption in wood supply is shorter in duration than if we waited for the trees to die before replanting.

To a forester trained in silviculture it seems obvious that the above reaction to a bark beetle invasion is the logical thing to do. Only someone with a romantic notion who does not understand the important economic contribution of the forest to the human communities embedded within it could think otherwise.

The trees that foresters plant after harvesting are not "inferior" to the ones they replace. In most cases they have been bred for improved quality and growth rate. And foresters are proud to be able to re-create habitat that will support a wide range of species. The example of the European Bison, or wisent, proves the case that forest management has not damaged the ecology of the Bialowieza Forest Region. Despite being hunted to extinction in the early 20th century, there are now nearly 5,000 wisent living in 13 countries in Europe. Impressively, nearly one-third of these are living in Poland, including a large number, both in the wild and in managed herds in the Bialowieza Forest Region. This must be recognized as a success story and it has occurred in the context of people and trees living together in a healthy environment.

As a final point to consider we should consider the beetle invasion in the same way we would consider a plague in the human population. Trees get sick and like virtually all species there are other species that can infect and kill them. We should think of the bark beetles as the tree equivalent to the Ebola virus or malaria fluke in humans. Yes, Ebola and malaria are "natural", but they are our enemy, and so to is the bark beetle the enemy of trees and the forest. The enemy of our friend, the forest, is our enemy too.

Thank you for opportunity to make these brief comments on the issue of forest management in the Bialowieza Forest Region.

Appendix 1

The Principles of Sustainable Forestry

Environment

- The most fundamental aspect of sustainable forestry is the protection and conservation of soil. Forest roads and skid-trails, especially on steep slopes, have the most potential to damage soil. Roads should not be built where there is a risk of severe soil erosion. Where roads are built they must be up to standards that will ensure long term erosion control. Temporary roads should be removed to provide more space for growing trees. Harvesting methods such as skyline cable systems and helicopter logging that reduce the area disturbed by roads should be used wherever practical.
- Logging operations must be planned on the basis of watersheds. The clearing of excessive areas within a given watershed can lead to flooding, soil erosion and damage to fish bearing streams and rivers.
- Fish habitat must be protected through careful planning along waterways. Buffer strips of forest should be maintained on major streams and rivers to maintain stream bank stability, provide shade, and maintain water quality.

- Wildlife habitat must be protected by ensuring that critical features such as winter range, bird nesting trees, and woody debris are provided.
- Biological diversity in its totality must be protected by ensuring that representative areas of all successional stages, including old growth or original forest, are present in each forest ecosystem.
- The forest industry's contribution to greenhouse gas emissions should be minimized through energy efficiency, wildfire control, soil conservation, and rapid reforestation of harvested land.

Forestry

- Government and industry must ensure there are up-to-date and accurate inventories of all forest resources on which to base forest management plans and to determine sustainable harvest levels.
- Care must be taken to use harvesting practices and equipment that minimize soil disturbance and damage to the remaining vegetation and wildlife habitat.
- Where some form of clearcutting is determined to be an appropriate harvesting practice it must be done in a manner that satisfies all the other Principles of Sustainable Forestry. Other harvesting systems, such as selection and partial cutting should be used where they are appropriate from a silvicultural perspective.
- All commercially valuable wood that is cut during logging operations should be utilized to avoid economic waste. This must be balanced with the need to leave sufficient woody debris and organic matter to provide wildlife habitat and nutrients for the next generation of trees.
- All logged areas should be rapidly reforested either by natural regeneration or by planting with appropriate species. (Throughout North America this usually means native species). Forest practices such as brushing and thinning should be employed to ensure the survival of the new forest and to improve the quality of wood production.
- The use of conventional chemical pesticides must be minimized by employing alternative methods of pest and weed control wherever practical and environmentally sound.
- Burning must be carefully prescribed and used only where it is necessary to ensure reforestation, prevent wildfires, and improve wildlife habitat.

Other Commercial Values

- Other commercial uses of the forest must be protected and taken into account when planning logging operations. These values include tourism, livestock grazing, hunting, fishing, trapping, honey production, and berry, mushroom and foliage picking.

Public Involvement and Recreation

- Local communities must be directly involved in decisions that effect their stability, employment, economic viability, and quality of life.
- Communities and individuals have a right to access information, to be involved in forest planning and to monitor industrial performance.
- Forests should be managed with concern for recreational use by the public. This includes the appearance of roadsides and harvested areas and assistance in providing campsites, picnic areas, boat ramps and trails.
- Visual impact should be taken into consideration when planning logging operations near communities, recreation areas and along major travel corridors.
- Environmentally appropriate practices such as recycling, waste oil recovery, solid waste reduction and management, energy efficiency, pollution control, the appearance of industrial sites and a positive attitude towards environmental programs must be incorporated in all forest industry operations.

Research and Monitoring

- Research and development programs must be undertaken to increase knowledge of forest management, to generate more value-added products, and to protect the environment.
- There must be an independent forest practices monitoring system that reports its findings to industry and the public.

Appendix 2

Patrick Moore, Ph.D. ***The Sensible Environmentalist***

Dr. Patrick Moore has been a leader in the international environmental field for over 40 years. He is a co-founder of Greenpeace and served for nine years as President of Greenpeace Canada and seven years as a Director of Greenpeace International. As the leader of many campaigns Dr. Moore was a driving force shaping policy and direction for 15 years while Greenpeace became the world's largest environmental activist organization.

In recent years, Dr. Moore has been focused on the promotion of sustainability and consensus building among competing concerns. He was a member of British Columbia government-appointed Round Table on the Environment and Economy from 1990 - 1994. In 1990, Dr. Moore founded and chaired the BC Carbon Project, a group that worked to develop a common understanding of climate change.

Dr. Moore served for four years as Vice President, Environment for Waterfurnace International, a manufacturer of geothermal heat pumps for residential heating and cooling with renewable earth energy. He also served as Vice-President, Industry and Government Affairs for NextEnergy Geothermal, the largest distributor of geothermal systems in Canada.

As Chair of the Sustainable Forestry Committee of the Forest Alliance of BC from 1991 - 2002, he led the process of developing the "Principles of Sustainable Forestry" which were adopted by a majority of the industry.

In 2010, Dr. Moore published ***Trees are the Answer***, a photo-book that provides a new insight into how forests work and how they can play a powerful role in solving many of our current environmental problems. In 2013 he published ***Confessions of a Greenpeace Dropout – The Making of a Sensible Environmentalist***, which documents his 15 years with Greenpeace and outlines his vision for a sustainable future.

From 2000-2012 he served as Chair and Chief Scientist of Greenspirit Strategies, a consultancy focusing on environmental policy and communications in forestry, agriculture, fisheries and aquaculture, mining, biodiversity, energy and climate change.

From 2006-2012 he served as co-Chair of the Clean and Safe Energy Coalition, a US-based advocacy mission to build public support for more nuclear energy plants to provide electricity.

In 2013 Dr. Moore, with his brother Michael and other family members, founded the Allow Golden Rice Society, a non-profit organization dedicated to seeing Golden Rice approved for commercial agriculture. 250 million children, mainly in the tropical countries, are deficient in vitamin A and as a result 2 million die each year. The Allow Golden Rice Now! Campaign demands that Greenpeace and their allies discontinue their campaign of opposition to Golden Rice, which could eliminate vitamin A deficiency if cultivated and consumed.

In 2014 Dr. Moore was appointed Chair of Ecology, Energy, and Prosperity at the Frontier Centre for Public Policy.

Dr. Moore is an independent ecologist/environmentalist with Ecosense Environmental Inc.

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