

Rupp, R.S. and S.E. DeRoche 1965.

Standing crops of fishes in three small lakes compared with C^{14} estimates of net primary productivity. Trans. Am. Fish Soc. 94(1): 9-25

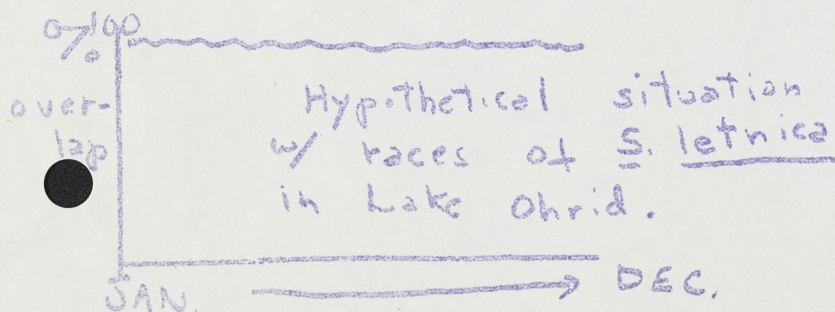
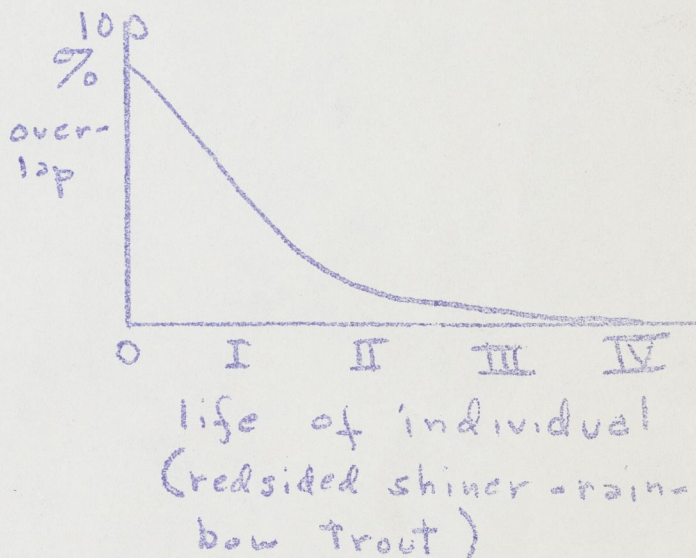
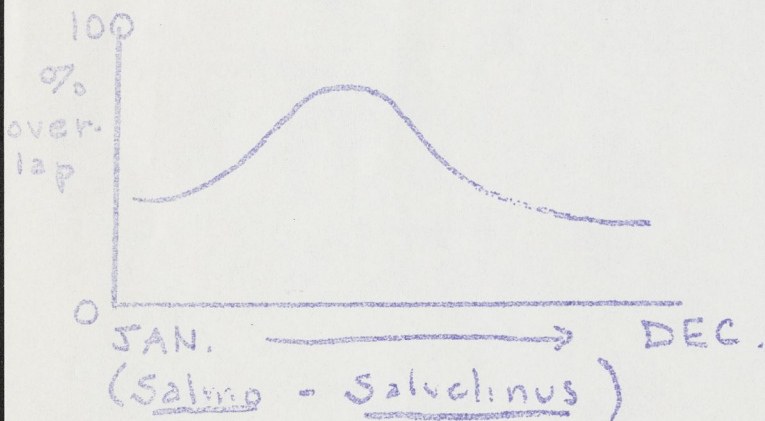
Am. Zool. 8 (1) Feb. 1968

- Energy Flow & Ecological Systems
- Animal Nutrition.

Gause's Principle that not more than one species can occupy the same niche, must be assumed to be a truism. During periods of superabundance of a food resource, more than one species may share in the feast, even those which may not be specifically adapted to the food. If the whole life cycle of an individual is considered, there must be some differences in this cycle between species if they are to coexist. These differences may be so subtle that cursory field work often leads an investigator to conclude that the requirements of the two species are identical. Fishery literature is rife with rash statements that this species of trout will out-compete that species of trout. If the niches are not distinct enough in an environment, then the species which is more highly specialized to fill the available niche will out-compete the other species. In another environment, however, the loser in the first case may prove superior or they may coexist and thus yield a more efficient exploitation of the environment.

The key to understanding the coexistence of closely related species is an understanding of basic evolutionary principles. When two evolving species come together, interspecific competition will favor those individuals which diverge so that a minimum degree of overlap in their requirements is attained. A new problem arises when species which did not evolve together are placed together such as brook, brown and rainbow trout. If they are able to coexist (Sagehen Creek) it is evident that their requirements are not identical. More refined thought on the matter reveals that within a species there may be subspecies or populations which may be highly specialized to fill a specific niche; eg. Lahontan cutthroat trout (lacustrine predator) and very different results may be expected from certain environments that would not be predictable if one relied on a broad generalization based on the species as a whole (cutthroat trout).

Recent work in Sweden demonstrates that two closely related species must be studied in great detail, both seasonally and annually if their ecological differences are to be understood. Species may behave differently when occurring allopatrically than they do when they are sympatric.



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Larkin, P. A. 1956. Interspecific competition and population control in freshwater fish. Jour. Fish. Res. Bd. Canada, 13(3): 327-342.

Food competition

Trout-char

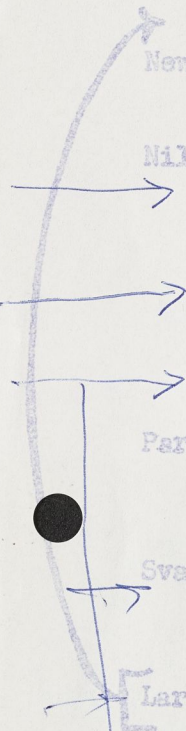
Whitefish
Coregonus

Trout-char
Whitefish

check for
more recent
papers
in Drottingholm
Repts.

Trout-char

+ Coregonus article
Le Cren's Nat. Exploitations An. P.p.



- Andrewartha Birch

- Murray Newman

- R. D. Mills

^{influence}
- Behavior on movement & pop. density
(Territory - home range)

- What about if areas change in density from no. - wk. - wk. - explanation?

ex. grasshoppers - data gives no. in any unit at any time.
- if only cover - may not be real answer.
- is cover limiting??

- How data gathered to be put on computer?

- what are requirements for recruitment?

- How stable is territory?

theories of pop. regulation
at trophic levels
(Slobodkin)

- Knowledge about pop. regulation - ecology

- behavior

- choice sites -
- largest fish inhabit
rate 1-2-3

- stat. how to handle data.

General

Pianka, E.R. 1967. On lizard species diversity: North American flatland deserts. *Ecology*, 48(3): 333-354.

Andrewartha & Birch 1954. The distribution and abundance of animals.

Elton, C.S. 1958. The ecology of invasions by animals and plants.

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Klopfer, P.H. and R.H. MacArthur. 1960. Niche size and faunal diversity. *Amer. Naturalist*, 94: 293-300.

MacArthur, R.H. 1955. Patterns of species diversity. ~~*Amer. Naturalist*~~, 95: 357-378.
Biol. Rev., 40: 510-533.

.. et al, 1966. On the relation between habitat selection and species diversity. *Amer. Naturalist*, 100: 319-332.

Stream Ecology

Marshall, G. W., 1967. Role of allochthonous detritus in the trophic structure of a woodland springbrook community. *Ecology*, 48(1): 139-149

Warren, C. E., J. H. Wales, G. E. Davis, and P. Doudoroff. 1964. Trout production in an experimental stream enriched with sucrose. *J. Wildl. Mgt.* 28: 617-660.

Keever, N. R., and R. C. Ball. 1965. Primary productivity and energy relationships in artificial streams. *Limnol. and Oceanogr.* 10: 74-87.

(Waters articles on drift may be useful)
(Torokini Stream)

- Cutthroat - Brook Trout
pop. - exploitation - coexistence

MacPhee, C. 1966. Influence of differential angling mortality and stream gradient on fish abundance in a trout-sculpin biotope. Trans. Am. Fish. Soc., 95 (2): 381-87.

- Rochat Crk., trib. to St. Joe R., Idaho, closed to fishing. - native cutthroat, brook, & Cottus confusus,
+ 1 spec. of Dolly Varden in lower section.
C. rhotheus. * brookies abundant in lower small trib. of lower St. Joe R. but scarce or absent in upper trib. where cutthroat abundant. (2100-2700 ft. el. Rochat Crk.).

poisoned out - all fish coll. - morning of day before treatment - 32 man hours fishing w/ worms. 6 in. & ~~over~~ trout considered creel-size. - No previous exploitation but few trout over 9 in.

131.45 lb. 83% of wt. trout 17% sculpin - lower section - less slope - more gravel - greatest biomass.

2.4 mi. stream. 454 trout 6 in. & over, (37% cutts 6 in. >
32 man hrs. fishing caught 50% of 13% brook "
cutts 6 in. & over x 25% brooks,

cutts 69 caught out 69 poisoned (one section 11 caught 1 poisoned)
brooks 79 222

Zoogeography

N. Eng.

- Brooks & Devey 1963

Osmorus | Kendall, Rupp, Greene, Zeller
Sundson, - etc.

Salvelinus fontinalis ayassii - Kendall -
aureolus > watas.
opassa Bakus.
timaganensis - Ottawa book (M^o King) - Pleistocene, Huet.

Salas - Powers, Kendall, - Devey - Europe Boothroyd

Coregonus Kendall, Fenderson, Kennedy etc. Lindsey
- N.Y. Biol. Surv.

- N=15? - overload slip - expect 5IT

- Outline: No text - contemporary ^{items} events, etc.
- ~~mid term~~ ~~take home~~ Main 'item' is final term paper
- mid term Take home + 1st paper 100 + 100 = 200
- final - Take home + final paper 100 + 250 = 350
- oral present. ^{to attend} particips (quot.) - - - - - 50 = 600
- No class Fri - end sem. - 3 2hr. sessions
write paper 5/ session

topic: Grad - Thesis res. ^{Conserv Biol} Ex. - Jorge: What is sp.
 how all and impl. for
 learn (myself) conservation - - -
 Good ex. of course content
 dif. undergrad - I tell you - you tell me
 stress 'uncertainty' is out -

Gowan - trout mt. & last year (book) ...
 new modif. - rethink - - -

* book
 (pg. - - -)
 how many want
 copies? / -

Ann Richmond - large weekly debris ...
 use as rept.

Undergrad - interests - ancillary to - ex. - habitat

- Col. R. salmon ^x Fisheries
 1.34 bil. \$ - 5.5% h/m.
 - why cont. decline -
 pol. win/win - power of fish too
 not understood - - -

Redfish 2. sockeye? - leakage
 sp. -
 gen. dif. -
 how maintained
 gene flow -

* hand in title next wed.

- 1st paper - brief overview 4-6 pp
- edit - practice - - -
- final - in depth but can do what want to -
^{8-10 pp.}
 concise, (I assess what you learn) -

* Handouts & - enough??

- Subject matter: ichthyol. - fishes not taxonomy A.S.
 "not precedent v.s. ^{Cope 12-14} Tuohi A.F.S.

- Evol. Ecol. fishes - - -

Deduction - ^{deductio} ^{reza} theme - Knowledge^{high} Evol. by N.S. works - implications
 - Ex. Col. salmon - generic hatch. - wild rules ^{bottom line} SURVIVAL

- VoTeh ed. - how to follow rules, > model HEP - IEM -
 Univ. ed. - gain reliable knowledge - HEP not taught -
 underst. complex, uncent. - limitations

- 8 copies

- Induction: specific situation - to general
- Appeal to authority - text, prof. rules, methods, model Pennak - Myxiz
- Illusion of technique - computers ... quantitative, data, sophisticated, unbiased, but wrong - Genetic quantit. DNA - electroph. E.S. - unrelated to what does - niche fill.

Yotam
Univ.

Wed - - handouts

- Copies of book ? - No class Fri.
- Next week topic - outline. questions? - Chou - mot.

handouts? - .. Top-down - end course - work up to answer

Illustrates: 3 common human errors - source is

Birds of feather
Court
low
guilt by ass.

1. Appeal to authority - Gould: Golden Rule - sp. - 4/2
2. Induction (Deduction - top-down) - blackbird - bird - known trout / bank trout
3. Illusion technique -

- Orderliness human mind - agencies - society - structures - rules
HEP ass illusion - - Assumption - model output is authentic

what comes - infer instead HEP = biol. real. direct re.

Illusion

1940s salmon - dams - appeal authority - Sec. Inst.

wrong - based on hatch. - generic stock - - Intersp. div. - adaptive?

- methods - map spawning ground - nearby - - predict no. -

- Patterns of regularity - sunrise - next yr. - weather - fishing days -

uncertainties

deterministic, stochastic

- My Epilogue ... - points

- Ex. common problems - pro vs. anti hatchery
White vs. Kochman - miller h. /

White

Classic Au Sable - 7200 - model -

Ex. - slashed than unfished broodstock CPH

Ziloci

- before spawning
- no advantage to size
fecundity by 23

turn over 2x
500 - 2000

cut
with R9
D8

infer -

- DOW
Kochman

10 books ^{paper} A75 = Center letter
 20 -
 10 -

Mon. Feb. 22

Most what seem ^{sub-c. ill. / N.R.} routine, noncontroversial - only when subversive - polarized view. end. sp. v. j. etc.
 our competence, validity of our sci. - ^{knowledge} challenged
 - Problems center on - Predictions - x = over old growth = 500 ft
 - x flow regm - some - C. & =
 method models to follow -- but based on uncertainty, unknown
 don't work but don't deterministic vs. stochastic

99% case time
 top adm. - Pres. V.P. - Sec. Int. - Agr
 ignorant of desirable knowledge - Directors -

- BUT top jobs: - directors, Art. dir. - not our business
 use model, follow rules. organizational people -
 - but. H&P come - Andersen - contradicts our goal -

- economic model - ¹⁹⁵⁰ Penstock Myer - detritivore
 energy - ^{370,000} ^{370,000} ^{370,000} ^{370,000}
 Appeal - Art. - data, method, model, meter
 Inductis - intern
 Illus. 2 Tech

→ Flathhead L - eagles
 - Peud Opille - > 1 mil < 50,000 - but lake trout lake whitefish bobbit
 - Dillon - Arctic char
 Harselton - smelt - walleye ↑
 but not rep. 24 yrs

Next week = Phil Oster .E.

biochem. ^{more on} ^{referred} ^{genetics} ^{work}
 - wallace - work
 (100 hrs) ^{time}
 - ESA definition
 - profile 'characteristic.'
 Ark right questions -
 UK paradigm - Short - W - no tow - hurtow - stress
 - need further exp. ?

* CU semi-slides -- Man. lecture

- Triwen paper -
- ~~Shoreman~~
- willis work - seminar
- facts don't really matter
it's perception that counts

(Soulder) Wu - cap base - snail - Colo.
 - Why ESA .. rationale? ?
 - what protected - su. - pop. -
 - how successful - 60 - 80 %
 - wise ~~but~~ M.V. - ESA - no protection to
 "non adaptive sp. (condor)" end to
 local endemics lacking vigor to
 expand their range - snail dsn -
 Devils hole pup fish - Coli salmon -

next wed. title outline
Text-book store

100 pts parts - all - 2
- perception -

Wed. Sept. 2 Environ. Ethics

- C.B. journal - C.S.U. people (- first student chgt)

colleg. - ~~disciplines~~ concentration
- degree - - -
conc. C.B.
- job? -

- youthful try to find self - new discipline?
self id. who am I
problem

1. 1-2+3

- Differ from w. MGT.

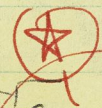
Table 1 -
hook / bullet student -

Leopold - A/B - Phil Pivter (West. AFS - 4 papers)
Duck Valley 1961 - wild/hatchery

- conclude - B group dominant imp. N.R. agencies - no need for C.B.
part w. M.G.

- next article - conflict - expl. trees?

Spring bur major
Engl term paper
communication
strategies



Conflicts: N.R. agencies - still driven by license sale
Cdo. - virtually no native game fish - reservoirs - outflow
non-native AFS most RB w. Albatross cut 1963 - 1963 - 1963 - 1963

Bears

realities

Naturalists' - Grand Canyon rip. w. G. L. Canyon - 214 birds

drainage - zebra mussels
why? - Evolution - Parallelism

- G.N.P. Rokanoo - eagle - Myrtle - camp Boadu
osprey - pelicans

(understand Evol. N.S.)

concepts
philosophies
theories - principles
logical national MVP I
assumptions

Leopold - Pincher - Roosevelt - conservation - wilderness - John Muir
holistic - ecosystem - preserve integrity -
Evol. N.S. / Evol. Ecol. - Paradigm

PVA II - methods models

Is Big game - McArthur - Wilson
sp / area ratio design preserve max. birds
extinctions

habitat
units
life history
Ernie Heilman

graze - * HSI
undegraded Red cockaded woodpecker

HEP IFIM - Dave Anderson -
Bon. rchicph. - 70s (own child) - C.S.U. modeling center

Romeshburg - Reliably knowledge - Nati Res. - Environmental sc.
"Sci sound" Russell Wildt. Ratops MT
grazed - ungrazed AFU - Patterns Regularity

Chapt. 8

1 Species - what is? 1-2 - fundamental
e. monophyletic - gaur th chimp man
- P. tanzani - sp.?
spotted owl - subsp. - mt. Gila red squirrel
maunal Lujan
ESA sp. defin. Salmon pages

H.S.I. - Rpanenburg SWM

N2Fankel & Sun Sei

conditions

- Eu gold

- protection

- bad shape

- better studies

- new conditions

A75 mini. net - section number for introduction

all bad - gold - crop - why no. 2.

Thur. brown boy
Fri. Dept. Opler

Mon. Sept. 28

- S.F. Bull * - hatcheries
- diversity (intra)

- Re. principles - sp. structure

h.M. Bass (Pyramid L., Bear L., Kenzi R., Kootenay L.)

Fla. subsp. (pop. - - values preserving biodiversity)

Practical - sur use Fish-Wildlf. mgr. - sell mon li.
mostly economic, practical

vs. ethics, moral - O.K. - all arguments - eclectic

- walleye - - -

degree of compromise - Chap. 8-9 - principles, parity of purpose.

Agencies - - -

Wed. Sept. 30 -

Re pop. structure -

specifically - Conserv. genetics - how gen. diversity distributed
pop. walleye sp. genetics

any indication of large ant. difference (long isolated
to gene flow) * C.B. structure Red cockleseed - all w/in sp.

but loss (H - % polymorphic loci) "inbreeding"

- Useful - but! - predict walleye (only subsp. extinct)
- prob. not good - specific L. loci

! vint as H. viciosa - continuous distribution - gene flow (Pleistocene)

- i.e. "methods" - limited useful - would see
very little "smog" type diversity - does not mean there

is any of importance!! - at local pop. level!
(dogs-wolves - h. victoria - steelhead - pb trout - 12 countries)

- ex: Pyramid L., Bear L. cut Kootenay - 6296 L.

Bh Kootenay - Skeena, chinook - Kenzi (none would

be detected by "Conserv. genetics" methods

- Chris Still

- S.F.A. - G.A. Lks Comm - -
- ex. I - IV political - internal group

- Thur - - spectrum - - -

fragmentation
Chap 9
proponent
advocate
sell their program

* wildlife Conserv. Zool. Soc. - jobs

- Mon - N. Acad. Sci. - est panel - reauthorize.

Week.

- brown bag - to museum - salmon / hotel

214 species, stocks, pop. - non tax - what are the S.E.U. -

- re. spectrum -

hatcheries - strategy - FWS (world's biggest) - NPS

- Poudre - FIS - complaint - states' request.

community - consumptive - non consumptive

- Estes Park

- re. Private organiz - pro - con - needed

- E.S.A. - spotted owl - to - where ex is gone

interferer or hunting - fishing - ? -

Wolf reintrod. - sn. raptors - Defenders -

- why - natural control pop...

- Understand public. - L. John poison sucking - R.B. Smith

* Mon - Oct. 12 - 23 (Oct. 26)

Questions

19-21

Prechtel

Oct.

26

① > Patterns - Processor - Aristotle - Darwin - Wallace

Linnæus 1755 - Lamarck-Cuvier (ca 1800) - Patten

what is sp. - what is diversity

immutable, unchanging, "good" sp. (varieties)

Dark Ages ^{stability} chaos ignorance - fossils, domestic plants, animals - zoogeogr. evidence

patterns

diversity organized into classif. = taxonomy

- study evo. diversity - systematics

- Genetics (Mendel) - 1900 - adaptive - non adaptive

Tucker's paper

Basis for rational preserve biodiversity - Paralyzing evolution

- ~~Paralyzing~~ - Resuth. E.S.A. - Tucker nonadaptive.

what is sp. - genus level. -

- Nature vs. Nurture - ethnic ^{superiority} -

Nazi - Communism - Hitler - Stalin

- Conceptualize evo. diversity - human soci. - culture - language -

food - music - religion - intergen. - hybrid displacement - Am. Ind.

* - Princeton Is. Biogen. sp. / zoo. ratios - MVP PUT fragmented

Hekinger gen. dist. - how dist. - why - among vari.

C.B.
Primer methods

Do ~~pr~~ Go thru ex. of C.B. practice - -

Sp. ~~for~~ proposed or linked and ESA. need basic
info. for protection, reclassification mag. plan -

- ~~Holt~~ principles in Biol. - sp. loss ratio (reserve
prevent ~~ext~~ design - problems fragmented) = MVP - ~~to research bits~~
models (ex. HEP) - PVA $v \rightarrow v'$ - genetic.

Pop genetics - geogr. dist. - allopatric (frog) - symp

Local ~~distinct~~ gen. divergent dist. w/in (same pop.)

how dist. geogr. isolates are - gen. similarity - \rightarrow ~~gen~~ F_{ST} indices

- Quasi. is valid sp. (ex. snail darter) -

Is it complete? -

- How you have all data - what do with it? What
manipulation - not whole story -

10-12

I wetlands - imm
II - Quoy's proposal - what do? critique

Weed
Sept 16
Chapt. 2
Pop. genetic
8.91
wit/owners
- dispass
- 100% n-tim.
- gene flow
770 with 3 rows
937 - 200 all
Collected -
Aust. bushm. (Per. v. 1000)
- Metasternum
- Kansas
- see p. 9.3
p. 96
P. occid. m.

* Keith Koupol - walleye - within/among diversity -
Sp. structure - how homogeneous - gene flow,
selective pressures - use of anthrop. diversity?
* Naturalness Colo. non-native sp. - non-native ones

Chris Still - Case study of regeneration of
dry tropical forest Costa Rica - conversion to agriculture -
* optimistic - model for conserv. proteds (worst case scenario)

Dave Fox - Livestock grazing on public lands (USFS BLM)
word - feed - multiple use mgmt. - historical how livestock
became dominant (Commodity issues - what agencies do)

David Gannett - Nat. Parks - popularity - carrying capacity
of people ^{RMNP} ^{Bear} (Recreation Dept.?) - politically acceptable - for the
enjoyment

Stephanie Vantress - Reintroduction: captive breeding
condor, bl. foot, ferret, ^{North} ^{Stout} greenback cutt. vs. squirrel,
raccoon - factors that led to -- still there??
(brook trout, poison) - non-native sp. Colo. basin

Wisent - (PVA-MVP) - w.w. II 13 animals - 47% fm 1 ♂)
wolf - pred. control - good prospects - bl. footed ferret - USFA
- coyotes

Shirley White * what is species?
Red wolf reintroduction / protection E.S.A - hybrid status
- natural hybridz ?? - introgression - disturbed
- introduce non-native sp. - cutthroat trout -
- John Boy R.

Erie blue pike
walleye
sillouet
L. trout
symptomatic
L. trout

- extinctions - if perfection - wh extinction
Science - lamprey - hogfish - turtles, marsupials, relicts - isolated
why so prim. - so successful ??
* - Naturalness non-native - Grand Canyon - Colo. fishes - pheasant why?
- more
- quite good
wildlife
- game farm ? w.

Natural!
- range spectrum
- Introduced [] [] ^{all} ^{diversity} ⁱⁿ ³⁰⁰⁰ ^{u.}

range of human concen. c.v.
organic

Sept. C.B. * Sci. Am. - May - zebra mussel - p. 22 with intro.

- Chaos theory p. 17

Mon Sept 21
Brown Trout

Internal Contradictions - Communitarian
- simple - owl/families

walleye
walleye
nominal
PHEASANT
Kevin
Cook

- purist viewpoint re. 'natural' w. artificial, non-nat
Nile -
- 'big' changes re. water - reservoirs, river regulation - PLTs, Yontese
Don August
- what can be done - the possibility change - use tilting windmill

- Fisher - zoogeogr. factors - Colo. - 1 sp. genetics

- Not much birds - mammal -
- seminar - phosants - Osprey
" advocacy group - Comm. (Indiana) |
Pardue pelicans
CARP - eagle

Moose -
Ruffed grouse

- Thus - ca 70% angling (license sale) Colo in R.B. - eagle
Chickadee
Myers

- reservoirs - regulated rivers - best - non native fish, artificial env

- but - N. Zeal., S. Am. trout - Calif. record L.M. bass

* Ark. 40% lb. brown trout (*Use Florida strip.)
- below dam - hypolimnetic water practical intro. d.m.
- low sp. structure

- Biol. - do away with - Colo phos. - Centarchus
- Ark. trout - Calif. - bass

If goal * Ex.

the implem

S.F. Bull. - Great Lks - ... lamprey - Peregrine
- hatcheries - dependent - Vision statement!
- photo col

- Mich - chinook - 'propag' &
- pressure groups

- biol. decisi - legislators - govern. - comm

- right,
- way

Understand!

- Kuyal - walleye

>lewis

80-90% >lewis

10-20% green

1961-1970-1990

Wed. Sept. 30 - Thur brown by lunch.
'Conserving biodiversity in managed forests'

- Make clean - inductive reason -
jump to conclusion - Common methods - C.B. - borrow
from pop. genetics = Conservat. genetics -

I: How population structured - how gene diversity
distributed - geograph. - re. gene flow length, completeness isol.
subsp. Flz. L.M. base - Poecilocypus occidentalis sonoran.

Design program - restore, protect S&U:

or applied - older age, larger size - mt. - valleys

II: fragmentation + gene flow interrupted - red cockleed -

H Σ polymorph. (inbreeding).

- Useful - but. not whole story - chapt. 8 - advocacy.
sell, promote ^{research} program.

- Limitations - (I) pop. structure - gives very tiny sample
+ what is sampled - unrelated to what organism does :-

(niche - life history) - pop. level, very slight gen. ch. -

- very many alleles valleys Colo. var. - no detect. dip -

w/in or among varieties gross level - measure gene

not sole determinant of S&U or taxonomy (what is on)

(II) - fragm. - H - direct rel. to ^{viability} survival

- captive breeding - bottom line more the better

- larger size better but no magic - MVP differ
PVA - assumptions shaky. by sp.

Keats
- RB - steelhead
- Dynamis - Bear
- Kerzi

- mailbox - under door Km. 15 W 2500
 5 wks. Fri Sat (take home) -
 → turn in temp pap. I by Oct. 23 24

Wed. Sept. 16

- 1800
 - Darwin - Extinction Paleontology ... it's very different
 - how explain? - special creation - evolution - it perfect?
 - ontogenesis - programmed in - evol. advance - replace
 - like new model out of - model - T - lost
 dinosaurs - dominant how all go - so fast? ?
 - periods of mass extinction - at 10,000 yrs - large mammals -
 Pleistocene - Pleist - west. N. Am. few fishes - catfish - mussels
 * lampreys - hagg fishes - why still around? - so
 successful - Great Lakes, sea lamprey.

lecture, text, other cases, lit. pers. comm.

writing (Papers = Draw on variety sources - analysis, synthesis, interpretation, organization = communication)
 Concise - Carol Miller - Fine - Committee

- Keith Koupal: walleye (CDOW - more effective stocking program - > fish > angler days & license) - CarBn? - broad view - integrate - how level I - Principle, paradigms, can be applied (to level II) - Motive vs. nonnative & Naturalness - artificial propagation - Pro - con - (Human dimension) - N.R. internal contradiction - bur. schizophrenic - CDOW mammals - ranch nonnative & hybrids - strict policy: disease, hybrid, - drive out n. (mandate protect, preserve, enhance wildlife).

- Fish - * historical (phylogen - zoogeogr.) factors
 Is. Brg. - headwater MO - Colo - venote II -
 fish vs birds, mammals, dispersal -
 - Dramatic rearrangement aquatic systems -
 - reservoirs (80% all anglers) 30% of historical river
 but natural rivers - Super Str - Fryin Pan - local b.
 S. Platte, Gunnison, -
 * Grand Canyon - L. Powell - native fishes / birds? - nonnat. - Tomavick -
 - Glacier Park - kokanee - eagles - Myxus

right/wrong
 good/evil
 strict/policies
 Politicians
 - civil w. families
 - big
 - old
 - children on bank

* RB
 not nat
 > 1/2 of hatchery
 - economies

* Carp - Poudre - birds, osprey, herons, eagles, ...
 walleye - ex. - not many fish jobs in west w. non-nat

Mon. Sept. 21

How sp. structured? w/in - among gen. variat.
 Common C.M. method (pop. genetics). Herring

- 3 'waves' Oriental
 Black
 Caucasians

(A)

Chapt. 9 p. 91 : H. sapiens 23% Asian - 7% among
vs kangaroo - 20-30% - cutthroat -
what explains : - isolation - drift -
gene flow - length, incompleteness isolates
selection factors - Walleye - cont. distrib.
vs. disjunct. - not expect but - most
signif. life hist. dif. - pop. level - Bear L.
Pyramid L. Kootenay L. - no "gen." dif.

Aust. bushme
Melanesian

SALG EYE

anon - m. alle. fish
- Frankenstein's fish
- Ted Williams

- Fig. 9.3 - Subsp. & Co. B. ?
- walleye: pred-prey - yellow perch - smelt Herring
- my specialz. ? - blue pike L. v. glaucum
L. Erie.

- Chris Still

Sept. 9

next week
Tutu-outin
Text

1) no classes Fri (Sem. 2nd yr)
2) 2 hr 200
3) 1st hr 100
4) 2nd hr 300
5) 3rd hr 100

3) Almost nothing

think global
big Fri
human pop. increase - resource use - local out-

Student chapter

Mon, Aug. 31 NR115 1:00-2:00

4) C.B. what is it? Preservation biodiversity - prevent extinctions - what is biodiversity? what is sp? - how many sp. plants - sn. (known - formally described - binomial name - S.E.U.)

21.5 mil. how many are there? 5-10 mil - 50-100 mil - why not wild? - Pi. forest?

No classes Fri. till 2nd 1/2 semester -

mid-final takehome exams (200 pts) each Fri. use 2hr

Ex. Ho your interpret. of how E.B. influences hook-bullet type A x B types Least - what changes in perceptions, planning, multiple use - Ex. US 75 2yrs.

Old growth forest - negative - bad - cut replace rapidly gain highly productive forests - win/win - big game deer ↑

* few target sp. (trees, mammal, birds, fish) - vs. holistic ecosystems - sounds good? - word-deed, (how much?)

* flagship sp. - spotted owl - amphib. - moss, lizard. (7.5. Inner Voice)

* Term Pap. - short/mid: overview of a problem (old growth forest, tropical rain forest) - outline elements

ok problem - Final Pap. - critique or report = solving (selective forestry) - in-depth

- Seminar / attendance, participation: qualitative - 1000. (7hr - -)

* Next Wed, Sept. 9 - titles Text - begin Chapt. 8 - questions -

MVP / PVA
ESU - p. 50-52 what is a sp.?
T x T - not T x T - how many sp.?
1:1 - 5:1 - 50-100
inbreeding - outbreeds,
priorities - corridor - bluffed forest

grad. undergrad
simple - c
good - defin - nu.
- vs. comp.
- 1/2

200 pt
question no
determine
night/way
- Aldo
Leopold

- anything?
- see D rules,
statistics,
methods of
study -
logical - based
- Leopold A-B
think like min.
Konten

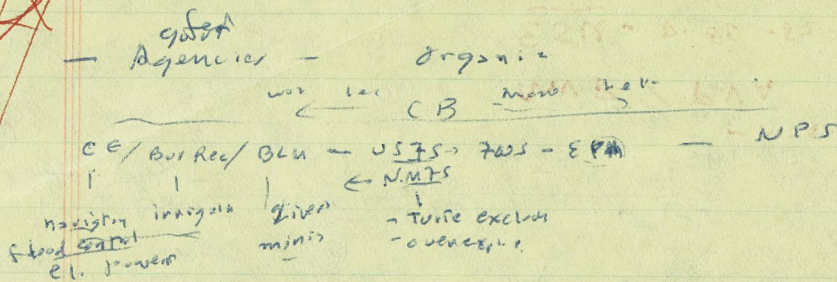
300 pt
(B in course)
100 pt

* C.B.
Soc.
Journal
C.S.U.
Student
chapter
plans?

* Summary & Conclusion Chapter

- files? =

Spectrum
★



NRA DU NW7 - Audubon - Sierra - Foot for An. Rigul - veget. position -

ST. Thomas
intrinsic resp.

↳ Ban Copy/ N2T, wetland Coalita - Inner voice

↳ Wx-An. Abode loc. - anti wolf

↳ Wise use mpt. - ATV - Horse
 forestry, grazing, mining, agr. 4 wheelers -

Ecology Zoogeogr.

wildlife biol. (controversial) (Sov. wildlife Mgrs.)

C. B. what ^{does} different? - E. S. A. - definite, sp
 - to population - what pop. - infinite in large sp.
 how select for preservation? - Chinook salmon - 1500
 2(3) Col. (sockeye sl. ID) - aware? - millions lbs. on sale
 mkt. - how can be end, ? - Ridiculous? - (Manual Linn)
 red-black what dif? - * End remember even poorest student must
 in-depth knowledge on biodiversity & why read the Sec. 4th.
 - Spring ^{Spawning} / Col. - upriver - sockeye 900 mil
 7000 ft. -

units of diversity - * adaptive - sp. abundance - ecol. options
 Col. R. (85000 40 mil lbs. count - now 5-10 mil & - all spat,
 com.) - hatchery - \$100 / fish - \$10 '15. - sell '72
 (* term pop. - salmon declines - role (limited) hatchery).

man improve on nature
technol. fix

* - Differ emphasis - Holmes Rolston Philosp. Rept.
 moral, ethical, duty, stewardship - Great - should know -
 but - (out + work, hungry. eat spotted owl - silver
 - Practical emphasis - ... sacredness of
 all life

Rational - ... Evol. by N.S. - adaptive - max. abund. -
 functioning in ecosystem - inter - intrasp. diversity

- Col. R. - chinook - Nohsim R. (3 races) -
 - Understand evot dif. sections - Canada goose - whop.
 Attention - nesting - predators - How irreplaceable?

- - - Re. S. E. U. w/o rigid taxonomy ...
 how select - C. B. - population genetics -

spectrum of
govt. action
organize

* ~~elect~~ tools electo: biochemical genetics - electroph.

DNA (mt DNA, rDNA) quantitative measure dif.

w/in - among dif. (isolated (subsp) - vs. unit) -

man (w/in) gene flow! - How sequenced? - i.e.

sole criteria - why - dogs - wolfs -

what about hybrid - (wolf - red wolf) - functions - niche filling.
 gene loci - unrelated in
 adaptation

MVP

PVA - computer simulation - fragmentation -

pop size, vulnerability, gene flow, - all life history reqs.

(slight of hand trick: ^{- per sp. - very few founders - bottleneck}
- rabbits inbreeding)

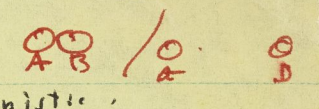
- bighorn sheep - small pop size (20-100) + ♂ breeding system.

- Refuge design: max. biodiversity - connection
corridors - rivers - (riparian) -

conf. of the
O.K. change
seminar
side report
Wed. titles
Ork. change
mind!
Mon. Sept. 7

- 1 C.B. meeting Tue. 5 PM
- 2 For. Sem. * = new trends C.B. A+B m.

text. ?
Papers ? - questions



confuse
data, quantif., sophisticated, in biol. reality

- Ex. - deterministic
- stochastic events
- patterns regularity
- cause-effect
- quantif. - simpler, better
- weak link

Keopold Parady
Is. Bridge
C.B. - Ewen -
nothing new but B > A no need.

necessary * sufficient
old
1st
2nd
3rd

rechecked
ESA
USP

level I
level II
general word
C.B. - Phil - reply
concept
methods models
phil. Milgrom
discipline
why agencies
like standard
methods
- nest - all that
necessary??

ASI redcockaded
- validated
- nest sites
- specific
based on empirical ev.

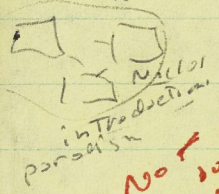
GIS ASI
MVP MVA (fragmentation in birds)
concept methods of methods

* Induction - Negative on model
ele. Graph. mt DNA
EX. S.E.U. - G.D. % seq. div

quant. score. ~ / time divergence -
if no dif., reject or SEU ? -

mt DNA - Fla. seaside sparrow - TATs
- dog - wolf - L. Victoria

how explain? - - regulatory genome - unquantifiable
what do? - role filling niche filling
+ scores - unrelated - unknown to signif. evol. change



No of sole basis
supplementary evidence

* Paper - Warren - Jonge what is sp. - how define, select SEU - understand evol. by N.S. - coevol. - coadaptation

* bouvieri - subsp. (chapt. 8) - L. (4 'macro' 'good' c. 500,000 yrs - good' sp. - no gene flow - 1 mil. yrs.

photos - Hells Canyon Snake R. - is it bouvieri? (Twin 72112)
identification bouvieri - lewisi - spots, coloration, 1-2 loc.

subsp - electroph / mt DNA (PCR - preserved) -
- but, Yellowstone - S. R. - Bonneville (-20,000 yrs)
Henry's L. ex. uztra - rakers, teeth - eclectic
- Ar signif. evol. unit

Papers: Jonge - Warren + Zw G92 - - O.K.
- Aldo Leopold + willieye ?? - Species problem & S.E.U.

- my papers - Jorge - Warren - heat cloud ?? = not necessary

* English major - Communications / scientific

- C.B. meeting Tue, Sept. 8 - 5 PM
- No class Fri.
- wed. 9th time outsize - names

blue sheet

Wed. Sept. 2

text - book - what - what fill -

to Chapt. 8 - fundamental unit - Sp. - what is - how defn

need for interpret. model - intrasp. - 'context' - organized framework (taxonomy) limited on
 when instead - E.S.U. - methods/models - MVP/PVA - limitations
 practicing in field - problems priorities - condor # - form # - 'flagship' - strategies

Review: What is C.B.? - no simple definition -

> all-encompassing (all members see - agree) - eclectic

- C.B. (1980 text) antecedent 1986 Soc. - youthful identity crisis

who am I: self awareness - 7/5/55 - no simple definition

most general level 'paradigm' - diversity good - should

be preserved, enhanced - all agree by merit...

- C.S.U. - Forestry -

Aldo Leopold - Paradigm - ethics, morality, 'good' - natural d...
 abstract Role
 'benefits' healthy ecosystem
 A x B -
 C.B. not in new - no need in - 7, 6 - B > A
 Forest (B = Inner Voice) High Country News

C.B. I Philosophies, Concepts, theories, principles, logical basis (biodyn good)
 Evol. Sci.
 - ~~ethics, duties~~

implement II methods, models, strategies MVP PVA - HSI

rules to follow?? communications - economics (N.R. econ. - contingent values - willingness)

Nature - chaotic - balance? - dynamic

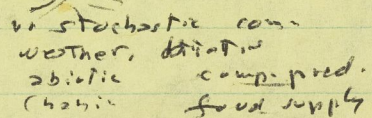
uncertainties, complexities, = unpredictable.

date, quantitative ness, 'sci. method', sophist. error - biol. real.

deterministic



simpler, better > clean-cut no water no trees



max. diver. Int. disturb. Hypoth.

bottom up - keystone pred - Top down - organiz - stable-unstable const. flow temp.

licence sales good?? dam - trout

- Hybrid - natural?

red walt - gray walt
- Fla. sparrow - one of

INT. context. - Naturalness diminished - good -
natural sp.

- DOW - white, longnose sucker
mission statement (diversity)
problem protect inst. - all good!
fact - fish - non-natural sp. (historical - phylogenetic - 2007)
distrib. -

Colo. - cutt trout, character

Colo. R. - 'Trash fish' - 1963 - 70 mil \$ &
Green a

- Environ. [no coeval - closedpt.]
- artificial - reservoirs - river
biotic - abiotic (non-natural) regulation

- Naturalness - Grand Canyon

non-natural - imp'd [Prodn] [Consrv] - levels
[Decomr.]
3-
prtk
Revised

Albert Gore --- "Earth in the Balance"

George Will - Trash /

Business Ed. RMN. -

Some book - diametrically opposite views -

environment - big issue - popular

Why V.P. ? --- Bush - Quayle - rhetoric - + on environ. issues

Livestock
grazing
waste - feeds
swain + water

- Critique pop. lit. on conservation issues -

- E.S.A. - "sp." definition - hujun - salmon races
sockeye, chinook.

--- can you dissect writings - for errors,

misconceptions? can use both sides - -

I mid term - broad illustrate Issue - some ex. - election year

II final focused Gore's book a review / wire use Mut. - / -

ignorance or misinformation -

Greenhouse Global Warming - Pro - Con

effect - Excellent ex. \uparrow CO_2 CH_4 A \downarrow S \rightarrow Temp. - unknowns - uncertainty

I state potential problem --- 'big issue' -

II pro, con, undecided - critique both sides -

(2)

- Although most powerful - reprod. isol.
- 2 major problems - Allopatry.

Assumption - reprod. isol. sympatry a mil yrs. isol.

Steelhead, rb, sockeye, kokanee whitefish - charn - - - dickcissel - birds

- homing, mating behaviors, signals - Temporal/spatial isol.

--- 1960's ... ^{intelli. invigoration} ^{Sokal & Sneath} ^(Paul Ehrlich)
 - ^{Monera} Major shake-up ... Numerical Tax. Computer

Willi Hennig - Phylogenetic syst. - cladistics - biogeogr - phyle ecol.

... Sp. real? (basic unit of biology) ... individual or members
 of 2 class? - a unit of evol. but ...

• Syst. Biol. - but now in Philology.

^{state of} ^{ant} ^{new} - Marc Ereschensky (Univ. Gt. Falls) - 1991 - Units of evol.
 essays on the nature of species. ^{Cambridge} MIT Press.

Patterson - 1992 - Philos. Sci. - Species, higher taxa & units of evol.

Simpson - Wiley Evol. & Systematics
 Nelson - Platnick

- Eliminative pluralism - no single deficits

Ecol. sp. niche fits or defines or sp. - eclectic -

evol. lines ... S. J. Gould - punctuated equilib.

adaptive zone

~ 10,000 million : * Most sp. ? good - no problem -

intuitively know - only 1% trouble maker -

- Problems w/ punct. equilib. - 1% ? AFS - 10-20% - RB - Co. It.

6 sp. - 4 - but 2 m. sp. interbreed - reprod. isol.

- Slides -

- define SEU - quant. ^{also} ^{sessile} ^{sp. span} ^{USFW} : int. D.M.A.

1. sample size 2. rel. what measured - niche -

- Dogs - wolves

Purpose
Intent

- culture - policy - tradition

Bur Rec. "Reclamation"

make water good - useful - commodity

vs. in river
navigation

C. E.

19th
Century

- expand
- develop
- conquer nature
- Transform

drainage

Navigability
channelize -
flood control

Religious doctrine

Main - Protestant - stewardship
G-ds great blessing
don't deserve it

Placemat - for human use
Islam plants, animals - P

Yellowstone NP

Am. 1872

falls - awe - beauty

What good is it?

How make it?

N.Y. 181 - family + 10-12 yr
wesley father

Evol. Ecology - Paradigm - Baum

VALUES

Value Neutral - (objectives)

Advocacy - self input
bias??

Ethics

Ex. EIS - USFS 1973 vs. extreme - Du. night
- bear hunting, fishing

- Bonnick Gold Mine NV
USFS - pit - non-native sp

- ESA consult
- Bering Back Natl. H

EMOTION - IDEALISM
(fantasy)

Values

- Instrumental (utilitarian) tree
wood, construction
commodity value

- Intrinsic (inherent) - beauty, spiritual
romantic-ideals
- Do trees have standing?
but climatic, effect
air quality

Public Trust
restrictions!

- "isness"

- G-ds will
destruction - significant creation
spiritual

RM
Elk found (Sheep / Pressurized horns)
Trust - cultivated - Trust - 7/10 with Green
non-native -
flows for equant
dry -
granular -

- 20% - wild
10% - native
education

any culture - scientific
policy system
best
ideal -
early people who in a place
nature of them

both commercial
electronic
Niagara Falls - Tourism
Yellowstone Falls

"isness"
good! why??

FW692 Evaluation Form

Speaker _____

Evaluator _____

Comments

20 _____ **Organization**
Logical order

Clarity

=====

30 _____ **Presentation**
Visual Aids
Legibility

Effectiveness

Proper English

Voice, speech qualities

Logistics

Use of visual aids

Habits, mannerisms

=====

50 _____ **Content**
Originality/creativity

Depth of investigation

Experimental/sampling design

Statistical analysis

Interpretations from data

Synthesis/conclusions

Ability to answer questions

Total _____ (100 possible)

=====

Summary:

Wed. 14 Δ 16 answer

Mon. Oct. 12: Take home - all 10 - 1/2 ps. 5 pp.

go over one more time: -
"hybrid vigor", exp. bar. - deleterious mutants
Re. inbreeding depression - humans/1st plants/sum. / protected for
H. sapiens - hemophilia, diabetes, cancer - prim. half-30, reproduce
eggs -

self interest
equal rights

simple. plain member of
biol. community. sickle cell anemia - Africa - malaria - shorter lifespan -
M.S. - purge - mortality! - humans. - ext. factors beyond repair

- Any other sp. wild - rid of deleterious

"Eugenics" -

- ~~Mix~~ spoils - toxic - revegetation -

heterozygosity
great diversity

Convergent Evol. - / Compensatory - mut. - sustainable

Go over Take home.

re. C.B. - preserve biodiversity of E.S.A. why
tax/phylogenetic - ecological - Spec. Causality - not possible

Sp. - what is (contra
origin?

Linna 1758
- very real
- but typological

Mendel
genetics
1900-1930s
detrimental
to C.B.

Patterson classified evolutionary thinking

Process - Evol.

Wallace

- Darwin - N.S. 2/3

coevol. coadapt.
genus, eidos

whole or movement

basic
for
C.P.

historical - Aristotle ---

1st 17th cen

1720, Urrale

classification

evol. ecology
function
origin
sustain

Solin Ray - 165-1700 - genus

Linna - Artdi

ordering of pattern

classification

- fossils cataphor
- 800 - Carrier / Lomark

1858
- Darwin - Wallace -

patterns - how explain? -

larger isolation
more divergence

endemism

- ecological - for filling niches - Trophic adaptation

handouts
Tucker

Genetics - mutat - re. preservation of diversity
extinction & straight line - saber tooth

- Funct. Equil - Fri. Jarm Bur Sem. harvesting, expl. salmon run

Wed. Oct. 14 - Take home in (Fri. deadline)

Chapts. 3 4 5 6 - 'species' Why ESU taxonomic/ecological aspe

What is sp., How many sp. - Global Biodiversity - biogeography.

Genetics: Conservation genetics (method #1 C.B. -)

Patterns & Processes: Biodiversity ... - Pain people - common

names - recognize sp. plants, animals - honor org. w/ food -

New Guinea - 168 of 169 birds

Concepts
affect
1920s -
Genetics
species
not determine
with use
not adapt
max

re culture & stocking resident trout
 - Col Poly - June 28, 1995

CO preferences
 wild trout / hatch
 CO
 no / sup CA1
 MA CT
 MT 1980+
 30 " 156
 value
 wild trout
 1982 census
 -94 11-12% — 52 94
 78% 70%

No net loss
 hatch jobs.

8% of angler days to catch
 value single day
 MT 1992
 30-56
 wild trout

role catch put-back (CWT)
 Big, Major points: inverse-rel. license - no catch
 - mandate - enhance (imp. investing in future)
 - mission - restoration (sound) to future return

Trout 1990 - 5 mil //

interanal review - extm inc
 - cost - economic under -
 John - - - - -
 from hill

organize
"Sci." study classification of patterns

- Aristotle 325 BC -- whole mammal not fish

- -- Romans - Pliny - Nat. History compendiums -

books
jes
men
griffon
no trace

- Dark Ages ... no original thinking (Islam - China)

- Renaissance, Enlightenment. -- John Ray Sweden Botan

modern classification based on examination plants - animals

categories ... 1686 fishes genus (not sp. -- polynomials)

1700

Linn. Anted: classify whole world animals inorganic rocks
1703-1735 (Linn.) - Genera - 3 vols

- Anted - 425 fish (sp.) based on dissections - Leyden Hall

No Nat. funding? -- Museums of merchants - died pauper

1758 10th ed. System of Nature (Carl von Linn.)

binomial nomenclature -- taxonomy - classific. of diversity - Rapid?

(ocean voyages - ^{specimens} museums) -- "Species" all biodiversity
^{sacredness of creation}

Special Creation - Book Genesis Literal Interpretation
typology - immutable - slight dif. - new sp. or variety

(synonymy - 19,000 birds -- 5000 - 1931 32 sp. = 2 RB, cutt.)

by 1800 ① ocean voyages - all diversity not all over: biog - regions

② crops - livestock - Agr. - dogs, etc. - "Not immutable" - varieties - imperfect

③ fossils - dinosaurs - previous time - different sp. - How Explain?

Cuvier - Lamarck ^{both somewhat correct} catastrophe - several creations & some

Phyla - Classes - but new sp. -- Evol. - single cell - progress

from "ooze" - strive to perfection - Humans ^{by} inheritance required characters - - blind case use, disuse (Lamarck) Stalin

process
Evol.

1858 100 yrs. - Darwin - Wallace (S.E. Asia - Ind. Archipelago)

Gallapagos Is. - longer separated - greater dif.

i.e. change through time - Darwin 1-2-3-4 -

- Coevol. - coadapt. = adaptive - survival - function

protect adaptiveness - options for future change - intra. d. E.S.U

What caused variations? How inherited? ... role of environment (Lamarck) indirect - sentiment

Nothing known - genes, chromosomes -- blending of blood

dominance/recessive - selective

Historical - human view biodiversity patterns classification, not implications
sp. for C.R.
Mon. Oct. 19
22-26
2 support
- orthogenesis
- saltation
- punct. equilib.
doubt on origin of species
West Oct. 28

1-2
2-3

Fri. Dec. 4

Mon Dec 7

Fri Dec. 11

7 species
- distrib. - dispersal
- birds, mammals
- Lysenko
- Mendelists, No. of genes
- Darwinists
- 100 genes
- 1000 genes
- 10000 genes

from biodiversity

single jump!

Extinction - one generation

- polyploidy - plants
- triploid - 1 seed
- tetraploid - 16 seeds
- Phloxes
- polar bear - dogs - cichlids fish
- but not emu

- Wed. Nov. 11

- Agree - Theorem of Darwin - punctuated equilibrium

peripatric speciation may
extreme d. to spec. - L. E. ...
Salmonid

(biodiversity) - useful = adaptive
- W.S.

ecocentric intrinsic
anthropocentric instrumental utilitarian
- if so, no explanation on special - Divine Providence good - no defense needed
- but - useful to man
- abundance - size
- functioning
- coexist - coadapted (Ecol-Ecol.)
- extinction is indeed natural
- but not due to ecol. change
- phylogenetic DNA content
- part biodiversity
- non-adaptive
- sickle cell
- flightless birds
- on Sr. - cats
- predict
- evol. circumstances.

implications
human evolution

spinoffs - how evl. work - nature/nurture
human society

social bid.
selfish gene

Nazi
Eugenics
poor, low IQ
mono ethnic

testable hypothesis
free
breed
phenotype

cooperative
criminals, etc.
self interest
selfish
greedy
but who
learning
negotiation

Misese D. S. Jordan 1923 - Korea - why
fish size Lee Wolff
genetic and
- competition model
nature & nurture
- both - how
Japan S. Korea
North Korea

handout genetics

but exactly intermed pattern
Darwin didn't have genetics, Lammerton - so wrong

Lammerton view - direct environ. influence caused var. in "particular" pan genes in every cell - collect egg & sperm.

reject Lammerton

sta. Mendel - genetics - 1902 - gene act ^{dominance - recessive} blended - integr ^{no environ. influen}

evening Primrose - macro + micro mutations - how sp. chosen role.
micro - not important - not adaptive * - N.S. - only ^{except} reject

polyploidy
tetraploid
fishes

editor/ not composer -- Johansen beans - - all some genes

plants, amphib.
saltation -
evol. m.v.

Conserv. Genetics deterministic.

Eugenics - Nazi - Master race
Neo Darwinians - Naturalists - Bergmann, Allen, ^{pruned} ^{coloniality} ^{extra} body size

but Genetics more 'scientific' reputable - taught Univ.

1940s - modern, evol. genet - Darwin rehabilitated (Conserv. ^{Evol. U.S. vindicates} ^{Genetics})

implications

C.B. ^{more spec. specialize}
creationism
intra sp. Geol

orthogenesis - ^{more spec. specialize} cleaned to extinction - life span - sp. or individ

intra sp. Geol
literal bible
inherent
no intermediate
- yes -

dinosaur, mammoth - the ^{non mol adapted} big ^{T. rex} ^{tooth} - the ^{tooth}

Punctuated Equilib. - - 50,000 not more

What is sp. 95% good sp. 5% for Darwin - ask expert

Evolution
- saltation
- why prim

Sp. definit. Mayr. Isol. - Recognition - cladistics (Syst. Biol.)

handout
Tucker
Behrke

How many - Jap. Journ. 26 fishes - vs. microceph fish -

E.S.U. - Text

wise use
end. sp.
mol adapted don't
interfere
Cells & fun

extinctions
2 types
2998
methods
Conservation
Genetics

what is sp. ? how many
- phylogenetic
- description
- extinction
- phyl. genet. + Curation
- Biol. M.V.
- Evid
- Recognition
intra sp. adaptation

Genetics
M.V. PVA
inbreeding
with/ during

Fri Dec. 4 554 1-2
 Mon 11 2-3
 Tues 11 Turn in
 13

review
 take home

Wed. Nov 11
 or What all shot - 130

re. ① Why want to preserve biodiversity - elements - factors
 success failure - obscure - national dialogue - ② - conservation, theoretical, practical

③ how changed N.A. species -
 elasmobranchs - Taxon
 Patterns - processes Darwin time Evol. ^{by N.S.} = adaptive - conservation

Gause
 competition excl.
 coexist
 diversity
 max. abund.

maladapted ecov. (at native sp.) - Evol. Ecol. - why we need it
 earlier exam utilitarianism
 Anthropocentrism - instrumental - good for us - human roots -
 Trickers - mycology Genetics - minor var. non adaptive
 Saltation - inbreeding

What good arguments
 or bi. edict
 minor variation
 introsp. pop. local

Wine wine vitifera - severely - inbreeding
 Nature/Nurture N.S. edit - accept reject

extinction - natural, inevitable - orthogenesis - overspecialized
 maladapted = extinct - Tricker - common in nature! -
 No --- what appears maladaptive - is adaptive in the

environment & pop. evolved in - sickle cell anemia
flightless birds Is. - introduced pred. cats, snakes, pigs
snod. fisher - sturgeon, salmon - dam block - new mig
 "maladapted" to human-induced new env - new relat.

*if trait
 under
 (survival) -
 adaptive
 How N.S. ③

Old saltation - 1920s etc. - SC - fisher, pop. salmon
 Coli R. - hatcheries - improvement nature
 thinking - Now - 1% - no dif. implications for C.B. - varied

Punct. Equilib. - universal - no! - test 1% dubious sp. - 10-20% - proportion of sp.

- but can occur - polar bear vs. 3 sub sp. U. arcticus
Exc. saltation - polyplidy - form. salmon - C. P. L. L. L.

plants - gynogenesis - fishes - triploid Plexin var. neogrup
Biodiversity - stimulated - small pop. - isolated - new spec. selection
polar bear - Arctic cons

- Generation time vs. evol. change -
insect - fruit fly - 10-12 day - elephant - human - chimpanzee - h.

* re. selective factors to change - adapt & new - it
 stable - no change - fossil - amber - Jurassic Park
DNA - how varied - dogs - salmon - 2 mo. intergener. h. Victoria Nature
R.B. - fall sp. - h. > 200 sp. 12,000 yrs

when adopt wrong theory - ^{soften genetics} Lamarck
 Big picture - beyond C.B. - R. Fedital
 implications ^{Lamarck} Nazi - ^{Communists} -

Nature / Nurture ^{identical} ^{P.S.} ^{Pr. Stanford} ^{Eugenics}
 heritability - ^{homocastwins} 70% - 30% - Jordan 1923 - Korea - why subjugated. backward
 - cut off heads of leaders - Today - N/S

re. ^{failure} Communism - re. human nature
 Marx - ^{Proletariat} Socialism - no govt. - self group cooperative
 altruism ? nature of system to be coop self-serv. for good + 90%

Sociobiol. - selfish gene - selection - pass DNA to next - first step USSR
 selfishness - test. - breed - Pharmacy - 1 Korok - -

- old - get enough - altruism - Rockefeller - ^{Social Darwinism} survival of the fittest - fit, nature/nurture
 - Humans can learn - why need govt. regulations - "interference" to his of libert
 4 names by Wed

Holmes 46 Mon. Nov 16 - Re. Sociobiol. selfish gene
 individual vs. group selection - ^{evol-genetically determined} individual self sacrifice for good +
 "species" (out soldiers) ^{14 months beer in colonial} all related for one ♀ - family lines -
 Jordan "1923" ^{no govt.} Communism - first socialism - ^{free breed + drugs} - no tipping - degrade
 hypothesis - ^{1 Korok} human nature - self interest - implications CB. political sy. (lim. ^{quarter 1/2})

Nature of humans - ^{short term w. Rockefeller} self interest - group interest ^{lobby} Fight environ. protect C.A.A. Form. Ber. ESA CWA
 common misconceptions - Chapt. 3 ^{Why pollution - ~~Evolution~~ degrades} ^{subsidies}
 Artificial vs. N.S. - ^{improve on Nature/Nurture} Treat salmon - hatcheries - fall spawning - day length (L. McInish Oct. - ^{temp})
 improve on ^{survival} - domesticated trout - ^{sheep prod.} ^{bighorn} could turkeys - chickens jungle fowl
 vs. wild ^{Hybrid vigor} - ^{hybrid vigor sign. crop} vigor - heterozygosity hybridz. good!

inbreeding depression - 2 lip history - ^{ink} - ^{mol 20pples} - ^{no nit} - ^{Stoolhead} cut R

Chapt. 3

more 25% local adapt. pop. level info. now

class $\sum_{i=1}^n$ Recap: before going over takekan -

→ C B - relatively new
needed?

Why for C.B. (soc. - new - journal began 1987) - very rapid growth, popular why

- historical background - how human societies perceive nature/nat. resour
- primitive - developing science - Pioneering - modern - but logtime -
got feeling

- Agencies - legal basis, set up single purpose strictly utilitarian - outcome:
instrumental, commodity value system - i.e. Nature to serve humans - our

goal then to learn nature's secrets to make it serve or more
efficiently (nature viewed as hostile, to be subjugated, manipulated, controlled
for direct benefits) ex. 1875 Rich salmon Col. R. - pollution, dams,
overfishing (open country resource - no regulates controls -- 1866 - 10 yrs - 6000 boats -
catch fish - Cannery operator pleads for regulations - not feasible nor

desirable - can restore, maintain abundance of "valuable" fishes by
artificial propagation - noise fix - technol. fix - 1908 - control hatch. -
hatch 60 mil. eggs - diverse parental sources in and out of basin

(chinook salmon) - did not understand "Species" - thought all pop
some "typological" concept (taxonomy - interspecific, varieties - slight diff.)
new sp. - 19,000 sp. birds - now 8000 - Ecology - biology - races, pop.
dif. - chinook - 10 mi. + 1000 mi. for ocean lit hitting types - upstream
stepped

migrational - downstream - 0 - 1-2 yrs. juvenile FW - spring run 6 mo. before run -
1 yr.

hot foot content - best for carrying - genetic, hereditary basis -
- hatcheries - billions \$ - BPA 1 bill. - 1980s - more harm than good
- break down, dilute, homogenize - lose local adaptation that was basis for
abundance - 100s specialist pop. more ponder biomass than one "genetic" type

- Why ESA listings today -
subjugate rivers - Flood control - CE 1824 navigation - focus on single purposes - dams, levees,
Great floods - Mississippi 1994 - S. D. 1st year - why - part. narrowly to
cut off flood plain connections - richest in biodiversity - isolate convert to
agriculture - urban development - now 1/25 yr. flood = 1/100 - 500 yrs. confined alluv overtops levee

Yangtze R. China - ex. old American way

- 1950s - new legislation - 59 multiple use - sustained yield - must consider all components +
ecosystem - mitig. (but 1964 Phreatophyte control - beneficial use of water yr regard consequences) 1969 NEPA - EIS on action
73 RC 1992 - 1973 ESA - log time

FW 555 TAKE-HOME EXAM

Give a brief, in-depth, definition of following, with implications for Conservation Biology.

1. Biodiversity. Book, All living organisms. 'Species' - how real - problems
polar bear - reprod. isolation - integrity - but resident w/ steelhead
unknown rockye kokanee

2. Ecocentric/biocentric view of nature. → Russia 2nd important

3. Utilitarian/commodity/instrumental values of natural resources.

4. Aldo Leopold. ^{-not biocentric} land ethic, Bid. A/B, intelligent treatment

5. Endangered Species Act.

6. Nonequilibrium or dynamic equilibrium theory of ecology (re: determinants of community structure and the uncertainty principle).

7. Ecosystem management.

8. Landscape ecology.

9. Keystone species.

10. Flagship or umbrella species.

see important

Friday Sem.
Grading +

Wed Nov. 5

(1)

- cited Kremen - 1st ed. (p. no. diff) 300-17-96
how got that way - st. fish/biol
essay & 2nd Ed. (reprinting Leopold 1990?)
publ.

- Phil Pister (p. 12-13) - UC B - Starker Leopold D7C 1968

sem: quantify + score

Ecol. Integrity - Ecosyst. Health - Performance - rate of primary grade

- rec'd Typo
Cottail Phragmites marsh - greatest in earth - monoculture - cornfield -

* design
vibron plus
nutrient
pollution
removal
public awareness

Media how reported (Wire-Use Mt.) - Congress - in Cong. Rec.

20-25 yr ago Look Mag. ed. (Tilden highly biased) * Pollution, Chicken kill, ...

Media report to inform public

L. Erie - more sp., more biomass than pristine! - Yes, but

- tealcut sp. - carp, drum, rbeophead (zebra mussels), white bass - how value

walleye, blue & yellow pike, whitefishes, gold/teal

extinct - Hexagenia mayfly - bottom (anoxic) deep, cool

Nov. Takehome - L. Ontario - > the Sup. most oligotrophic (tragedy of common - editor)

- Ludwig et al.

- enriched - reversal - forage taken - salmon, trout

Nov. Takehome ^{no role re.} nonnative sp

— next 2 wks - how address Nov. Takehome what plan?

Urban & Non-native sp. - diversity - Grand Canyon wetlands summer 2003 - sewage, storm water system

- but purple loosestrife - control / w. Russian olive - what native sp. would grow?

re. coevol. coadapt. ecosystem = artificial, man-made.

1930s - wind erosion dust bowl - clear-cut - Great Plains - grasses windbreaks - crops of wheat.

shelter belts - trees Lombardy poplar

- NB tree state Arbor Day - homestead w/ trees

Conserv. Tree planting - NB - Omaha paper: not native - ecocentric

- native, non native? - achieve goal reduce wind, water erosion -

quote
Angewandte
Sem. national why anthropocentric
Ivory Towers

wildlife habitat ^{coevolution} present, deer hunting &, waterfowl - wetlands functioning
Biol (Ecol.) Integrity vs. Biodiversity ^{CWA Fed. regulate} differ - to native/nonnative ^{how measure} Ecosyst. Health

Artificial diversity cannot provide for full array of societal values that native diversity does. What society values that

Agri - completely artificial - primary production -> human or 2nd if ^{most dairy} ^{value} ^{productivity}

- more artificial ^{Art. process} windbreak, shelterbelts, nonnative trees, shrub

- Metro areas: ^{value} parks, botanical gardens, zoos, "value" ^{nonnative}

- Reservoirs, river regulation 'values' power, irrigat, ^{quantity} ^{recreation} ^{days}

30 years ago
 C. O'Connell
 ESA
 EPA
 water
 single use
 specific
 human health
 Sugar Beets
 texts
 Biodiversity
 E.O.
 w. in
 multiple use
 sustainable
 wild
 w. Sines
 w. 1991
 EPA 1991
 G. K. Wilbur
 1996
 40

- Goal of final telecon - real-life understanding of N.R. inst. - ^{return} weel by Atom
 - why not subsection two A75 RMS for. it col. by Doc. Sect Term 12

"conservation" = ducks, deer, trout, vovs, wood, AUM, water, minerals
 1966: NV Red. phreology (water) exotic grasses (livestock)

holistic, multidiscipline

if subsections: "fragmented" - w. connected, corridors

Western & Pearl (SS)

- grass roots community involvement - win/win corridors - open space, watersheds real estate
 - popular - people driven vs. by govt. fist (O.K. totalitarian)
 - mid level bureauc - power - ESA - condem - coll. work
 - spirited soul - Regan - Walt 1980 - USFWS Dir. / Reg. 7 director. (Envir. organized) - go to court

flasher - agencies different missions - Phil Pister sp.

30 years ago

D7C - 1968 - I was at 2nd meet. - Devil Hk.

citations: Pister, P. 1994. - pages in: M.C. (ed) Proc.

2 authors, and 3 et al.

- Wm. Jackson - good range of citation Ec. Appl. U.C. Law Review

Candy - publ. in Avk - (what?)

Essay box

Pister, E.P. 1997. Agency multiple-use conflicts. Pages 12-13. in G.K. Meffe and R.R. Carroll (eds). Principles of conservation biology, 2nd ed. Sinauer Ass., Sunderland, MA.

- 2 authors Smith and Jones (1996) ... the world is round (Smith & Jones) (1991) Smith et al. (1990) - in citat up to 6

11/10 - Sim. and 11 other authors

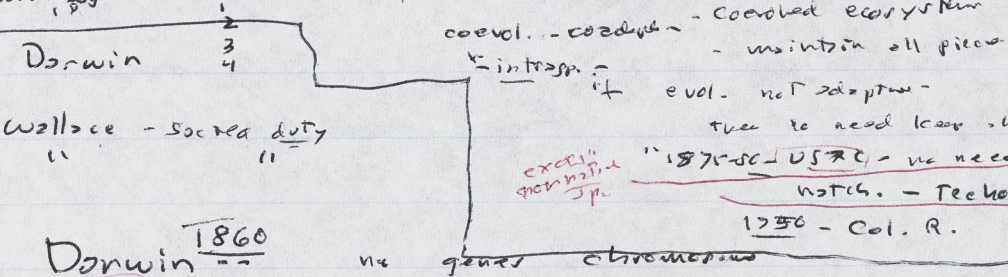
* - eds system. C.V. Bonker - Statute book: Devil Hk. water. BEM land

based for development ESA USFWS USGS - main use

but golden trout wilderness - USFWS - guzzing. Bulweiner B

subsidy dogma
 Phaeotophytes - beneficial - non-bourgeois
 WFS needs - "costs" - greatest sediment -
 grazing - coprotopog -

self interest - group - species - & political
 Technology
 why preserve biodiversity



* handouts
 - Genetics
 - Herper

ultimate process

1860 Darwin
 how change - what unit + influence on
 pangener - direct environ. influ.
 gene, mutation - variation - random - selection

is evol. adaptation - intra sp.?

Genetics 1903 Mendel's pop. - white/yellow dominant vs. recessive
 chicken black vs. white
 bluish grey vs. black grey
 mutation - minor variations

nature hunt size bear self-preservation
 Species - macro w. micro mutation - intra sp. - > discipline?
 Mendel-Morgan - 1920s - Naturalist Neodarwinian - Gulgen, Allen, Bengman
 extremes - body or self/comp. nat.

orthogenesis - evolution with character displacement

Chapt.

Modern Synthesis 1940s - Dobzhansky, Huxley, Mayr, Lumsden - Darwinian

environment - hard nurture -> nature
 illike persons -> social
 cold tolerant winter grains put seeds under snow

Nature totalization - genes for goal + soc.
 Nature for goal + soc.

Kaysentha - Russian Communism - Lumsden
 bizonne - Soviet agr. / nature

how sp. structured
 H. sapiens 98% among gene flow

1948 - Shoenman - full report of the greatest res. - J. Smith
 1964 - Krucher - bolnits

Nazi - Hitler - nature! Anyan (Parris tribe) Purity - Holocaust

Thoreau | preservationist | spiritual romanticism - wilderness
 Muir | great good vs. evil

1900 - Roosevelt - Pinchot - Yale - Aldo Leopold
 Aldo Leopold Land Ethic - good what prevents, assists, integrity

CSU Coll. Forestry - 1926 - Forest Ranger - Rec. watershed

how humans perceive 2 part sci. research social sci. - but very diff. - 1950s - Ecol. Zoog. - Commercially oriented
 Nature - Nat. Res. - highest use / most beneficial - fish culture 90% 10%

1960s S.V.M.V.A 1978 Newlands Proj. Pyramid
 73 E.S.A Prog. Conservation - miscellaneous
 76 NEPA "preservationists"
 Log Time

W W F E. S. A. list

Printed Page -

Defenders Wildlife - blurr 14
Eco/Bio cents

anti C.B.

- Anti hunting - Am. Right - 201
- Bison Plan - - If Scudder
hunts > give
to other
- Schumacher Leopold
- channel maintenance

Form Bur. - Most powerful lobby to west

- push wire use agenda environment laws, ESA EWA SPA*
- fed. gov. - takes but - defend laws has force - much narrower?
- ?? - 4 mil ^{mil} 1 mil forms (- mess corp. - sell insura
not forms - insurance co. 6.5 billion \$ gross
Tax free = 100 mil.
- Who pays pipes calls form. IRA 82 mil \$ form.
- contribute to corp
110,000 PPE - 2/11/01

Nov. 2 (Fri. 2 weeks) discuss next week.
Method classif. - Phylogenetic systematics

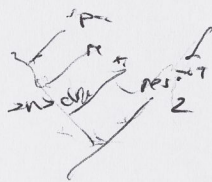
classify by branching pt.

1. 10000

cult

Mayden "deterministic" superimpose phyl. on map - dist. - genus
Historical Biogeography
trace routes
(dispersal) - now
structure

Numerical taxonomy
computer
not enough



Historical Ecology

"Tasgic" -

13

~ Ecosyst. Restoration next yr.

Waterhead Restoration book

Kissinger R. now

- Everglades

C.E. redid plumbing

- Nature knows best

- Testable Hypothesis

- Col. R. salmon

- adaptive = survival

interact
genetic drift

vs.
nat. sel.

Kalama R. steelhead

- Pymouthe. cut

41-62 lb. max size

v. 1.

8-15

FISHERIES

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additional mailing offices

Method
Phylo. 12/88

Eastern U.S.

Miss. - Ohio R. S.

but
sediment
method--

- have lip sucker
29.4001
8 stem
in 1900

forests cut very far in est

- Collins practices

- 290.

- next 77
hipsters

2 (12w)

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000230 DL 12/99

Robert J. Behrke
Dept Fish & Wildf Biol

CO STATE UNIV
FORT COLLINS CO 80523-0001

DSS
Restoration

- Any matter, subject - ?

- how real
- how many

Chapt. 3 Sp. in Conserv.

- Sp. problem - methods, theories

Greek Philo - Roman
Eidos - essence - eternal, circumscribing ideal 'type'
typological - Linnaeus - immutable
"in no wise" imperfectus

basic
truth - real
can't get it

Sp. Concepts

Reprod. isolate - maintain integrity -

temporal/spatial

B.S.C. - isolation - allopatric / sympatric

- if symp. w/ R.F.
then good sp.
Mayr

P.S.C. Phylogenetic (= Evol. Sp. Concept) -

- before genetic

- Recognition sp. (birds, cichlids - 7 w. fishes)

- steelhead
R.
Kokoiu
- sockeye

Are sp. real? - Yes, but some more real than others
can be used as basis to conserve? why E.S.U. & S.S.U.

"Conserve diversity not tax. names"

- fine spotted
hues? S.R.
but real, impt.
problem of 'rules'
degree dif. w/ T.

* Box 3A p. 69 - Not all animals equal
Keystone, Indicator, Umbrella, Flagship

Prioritize 3B - Taxonomy - greatest diverse
70 - genus = 1 sp. - 1 > 500

P.
3.C Rose is > Rose = 73 - 7L seaside sparrow
- modern tech - genetic mtDNA
- 1% sample = conclusions?
- cichlids L. Use
- degree

Environment degradation
species

- reduce in Natg. diversity
evol. opt.

typological
concept

p. 80 Manuel Lujan red, brown, black squirrels
squirrel / spum what dir what good?

How many? 30 mil \$? -

what is - ?
No matter insect

models

Methods MVT PVA Is. Bique
sp. / zone / estimate

Chapt 4 Global Biodiversity

5 Global " # Lower Threat

6 Genetics

Conserv. Gen

w/in sp. - intraspecific diversity

Methods

w/in Among how gen. diversity differs

Sociobiont.
guppies

inbreeding / outbreeding depression

ecology - trade-off
prod.

define E.S.U. : genetic data?

- phylogenetic or life history - ecol

Nonnative sp. why -
utilization
intrinsic ecol

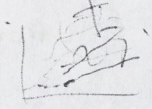
Reserve Design
network

- p. 198 Limitations of genetic conservation

- too much noise with no understanding
what make of 100 base pairs

- species quantify by differ % sequence divergence

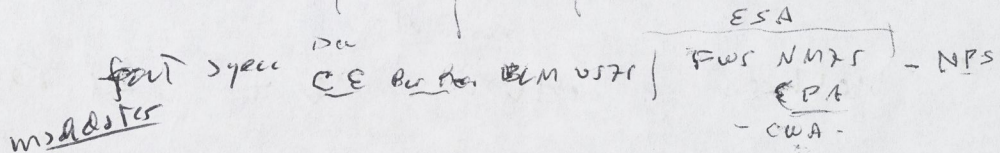
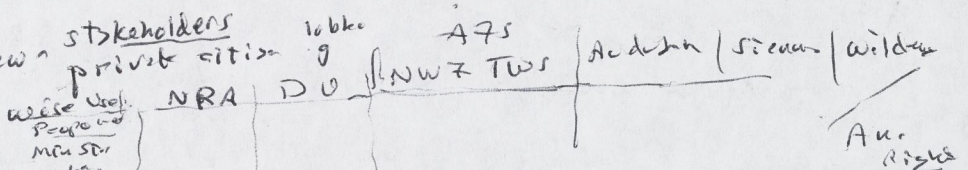
< G.D. - alleles - loci - 95-90 - ?
- - - - - 60-80

base pair -  molecule clock.

Reliability

Ecol. Restoration

- How to be effective?
- polarization - priv. view



Wed. Dec. 10 Fri. Term Pap. - 6 PM Fri. Mon. - system of great credit
Sem. slides?

Extinctions: Real, but... predicted catastrophic rates predicted on no hard data: i.e. not testable - untrustworthy - no one knows how many unknown sp. 5 mil - 100 mil? Statements, pronouncements - not supported. Wilson "take unbelievable easily 100,000/yr. - Ehrlich's 235/day mil. in 10 yr. 1981 book almost complete by 2020. Myers 25% by 2000 3 mil 75% Myers re. Science Scientists as authorities - rational, uninfluenced by emotion, personal beliefs = > gender (females future based) - on humans?

re. species going extinct faster than new evolving. Left off - why Af. lakes 300 sp. Fichl (endemic sp.) vs. 1 sp. lungfish - lungfish ancestry > 300 mil yr. to speciate - L. Victoria's 2,000 yrs. - Why? DNA - senile? - but all DNA same, same rules. Dipnoi fish

- 1. specializ. - body jaws, teeth, oliv. elat crush molluscs vs. chick - great vs.
 - 2. mating system - recognition sp. concept. reproduct. isol. gen. diff.
- Where sp. diversity greatest - Tropics - why line growing re. Habitat diversity - ecosystem - climate: vegetation - animals.

- What sp. most important? - Biomass: Ants, Termites, Seal Keystone

re. functioning! Ehrlich - nivets popping - plum crashes

Atlantic
- some sp. more important - everything tied to everything - but some much stronger links - mutualism - Dodo - tree
- replacement, funnel energy source alteration of sp. - ex. herbivores - Citric acid, Cephalopods
- river to reservoir diff. actors - Evolution Theater same roles
- Extinction natural > 99% all sp. extinct -? desert end vs. extinct by change

sp. like sp.
- Sabertooth, Dinosaur - ontogeny -
- Extinction good - stimulates new ecological evol. - Cretaceous Diver. Small mammals humans
- Convergent Evol.: niche filled by diff. phylog. N.Z. minnow - Jackal denture - Locher feeding - shredder, collector grazer, filter feeder

how get? Re. humans - live harmony nature? self-interest - short term -
USSR L. B. ... waste
cellulose - Polarized - Romantic idealists vs. Development Progressive Conservatism -
Highest good, Beneficial - Human spont. fun. vs. Pure - Not P. Res. Biodiversity
for human use: How to use more efficiently - technology - Karl Marx Comm. manifesto

* E.S.T. Bull! - Tucker's yearn

Mon. Oct. 29: Tonite 6 PM - here... slider, etc...

- Fri. very well - ¹⁵⁻20 min problem: learning exp. - pt -
- Compensatory - Additive - Pred. Control - foxes, - pheasant - cougar - deer
- muskrat, mink - Everington oversimplif. - Elton fox-hare simple case - Elton
- inductive - deductive (null hypothesis) - specific vs. - broad generality.
- mourning dove - vs. geese after report.

but - man's killer ecosystem use of - birds - predators
Krill - Antarctic - food - univ. - whole - whole
ecosys. - keystone sp. -

how can exploitation increase abundance?

* Ex. stimulate - floods - return - reduced cost

P/B - intervals

- older, larger individ. less prod.

fish - indeterminate growth
unexploited
exploited

guppies 2/3
13-17
surgeon

Age	0	I	II	III	IV	bin
10,000	500	250	125	62		
10,000	2000	1000	500	250	125	
				70	1	

WT - 1 - 10 - 20 - 40 - 80 g. wt

P/B = 2.0 - 1.0 + 1.0

gross/net

from west

Question

Unit. of protection: Wildlife Conserv. -

Argali sheep - Ovis ammon hodgsoni - End. sp. cater

Nepal? Tibet
Sinhay
Mongolia

delimitance - validity?
Fex L. Williams
range - disjunct - 7 US decline?

2 subs. - hodgsoni only Tibet
Gansu

musk deer
or sp
per
order

→ tax & nontax units - no big deal - tax - sp. subs. - not equal

not accurate reflection of biodiversity -> gr. re. Univ. grad prog. tax - birds
- if Strix occidentalis
3 sp. - eastern - spider

- Gen. quantif. - electroph. : karyotype: mt. DNA, immuno-

* much signif. not quantif. - races, subs. - life hist. - shade - Fl - Kenai K.

- among w/in - if all w/in - not so much emphasis on races

but lt. species - w/in sp. - 3 races - but pygmies, At. busha

* Provide insights: Chapt. 9.

Tucker's

Wed. Oct. 31

Hypoth. Paden -

Induction - Deduction

* non-native
 mysis
 Ervington
 Elk - starvation - pred - check - balance
 yellowstone
 Simsbury
 Gills - chub
 Elton
 rabbit - fox - two open.
 simple system^A
 Induction

control pop
wind

Chapt. 9 - 10

birds - Fu x
 Zoogeogr. - from Neavate - 9
 Unit selected by GAO
 Tucker - Committee
 snail darter
 - white darter
 - nonadaptive - polytypic

- Evol. - Bruce Bury - Pisten

Gordon Reaser

unit + can

Chapt. 8 - taxonomic approach limitations
- phylogeny ->

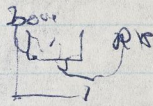
No magic verb

o.d. - spl. c. = 1.2 mil
o.s. = 40.00
25x

9 Pop. genetics

- treat salmon, *Oncorhynchus* most studied.

cott. phylogen - major subsp. well defined - but



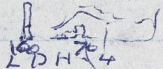
kenyotynes

2N = 58-68-70 AF 106

Fig. 9-1 - B most common

but allele A, B, C rare

bc dif. pop.



calculator

p. 91 w/in & among diversity

2 races

72% 95%

- mobile sp. - but still recognize dif
- gene flow w. gear 15%
- any sample any race 93%

vs. Kangaroo rat

70-75% only 30%

applicable?
Pyramid L
Bear L.

- dark skin
- hair color
- eye
- features

but 2 genome
struct - metabolic - weight

at use at
unstable / summary

re. it
size 20%
me top.
new mark
dive
genetic
assess

* fragmented - gene flow

p. 94. Ecol. genetics

esterase alleles - rocks - red skin - dan

re. allele to adaptation

(van der dore)

Kohn - musrel - L.F. sand
salinity

o.s. - 1/100
- e.s.

Fig. 9-3

p. 95 - P. o. o., P. e. s.

subsp. - good reflects - phylogeny!

x undescribed Mex. - Rio Mayo

1 mil. isd. - no gene flow
'major' subsp. -

10,000 subsp. - w/in - no dif

Chapters 10 considerations

> generation time - suscept. to extinction - no. v. cons - Gordon
 respond to rapid change - Gricey

(DDT) - fruit fly vs. man - elephant - nitrogen

* but evol. rate > gen. time - man - elephant

natural
 local
 extinction

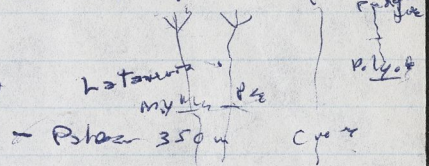
* - tax2 - 1 sp. order - Pansolin -

- priories
 - genome - how dit.
 how "replaceable" - Aust. lungfish
 - Amiz colu -

- descent biogeo
 Pteris global relict!
 - not well adapted

4 Ovis - introd. Ariz. - desert dog - coevol. coevol
 * O.K. - Bailey great outcry

* amount vulnerability reprozy
 (how dit. fun necessary)



- megafauna
 - Pteris
 - colubus

Wallace
 Howard
 2-1-2: 221-250

IV - Conserv. Resilibility

Human self

- Human fitness
 - Eum. errors
 - (M) loops

- Conservation values - independent of human values (Nash Arle)
 intrinsic - all earth's biol. processes - precede & exceed human presence

cultural based: - furs - vegita. - rights

- cultural
 regions

- cultural sickness & arrogance that
 reduces all values to consumer values

Community - C.V.M.

Animal liberation / free
 rights human labels

wildly hated
 80% no dir
 20% - high val
 experts

Collicott - In. lib. incompatible w/ environmental ethics
 Aldo Leopold. well-being individual animals

environmental ethics
 welfare of
 species, natural systems

Af. - elephants
 Mex - birds

Fall '97

Aquatic Seminar

Brett

Enclosed are some papers useful for seminars. They might be shown to students to see something about subject matter that can be roughly broken down into two broad categories

BOB BEHNKE
DEPT FISHERY AND WILDLIFE BIOLOGY
COLORADO STATE UNIVERSITY
FORT COLLINS CO 80523

I. Why: theories, principles, empirical studies relation flow to diversity or certain species (recreational trout angling)

II. How: methods, methodologies re. predictions for optimizing flow regime (why none work very well).
Hopefully, seminars will cover both aspects.

C.B. - Nouvelle Cuisine - new wave party old time
 C.G., Ecot. L.E. (resource dev) - R.E. (restoration) - Ecot. Econom. - Fisher, Edwards
 - Ecot. Umbrella - me

Eclectic
 why C.B. Spec. -
 Am. F.W.S.
 - so
 - Lesson
 - absence
 - Fill in
 - holistic
 - integrated

Flagship or "umbrella" species (ex. spotted owl and old growth forest)

Keystone species (some sp. in some ecosystems have an impact on others)

Biodiversity, Species, subsp. (what is, how real, DPS, ESA, IUCN)
 Conservation genetics: molecular genetics, quantitative (phenotypic) genetics

Landscape ecology (a matter of scale) scope of

Ecosystem management (goal to maintain)

Equilibrium - nonequilibrium (dynamic equilibrium) (balance of nature) or (Locke Thayer)
 pop. viability (or value) anal. (PVA)

min. viable pop. (MVP) (comp. modeling, assumptions made)

stochastic, deterministic, uncertainty ecot. integrity (structure, function, group of ecosystem)

human value systems nonnative species
 ecocentric, biocentric, anthropocentric (human views & perception of nature)

multiple use mt

metapop. (connectedness - fragmentation - Wildland Proj.)

Aldo Leopold and the Land ethic

Think globally, Act Locally

Diversity - how many sp. what is sp.? D.P.S. (insects) - 1.5 mil sp. 5-10 species
 E.S.U. - 7000 sp. 3000 sp. trophic level
 - human pop. - 6 bil 2000 - 3000 - 3000 - 3000
 - primary herbivore
 - secondary
 - energy re-use demand
 - fishes - wild - game birds + insects

Diversity of human talents & expertise besides - Br0197
 - public support (pol. sci, soc, psych, edu)
 - holistic - cooperation of var. agencies (business, gov) - philosophy
 - intact - ecosys. org. - forest - land. dec.
 - economics (Nat. Res. Econ.)

Now "scientific" - C.B. - Science tests hypothesis - open urgency, real

not possible - sound prof. judgment - to knowledge exper

- steelhead - nb (sp. ? - genetics - ! heterozygous basis
nature/nature
dogs - wolves -

disruption. degradation, nonnative

So Platte - rip. corridor
veg. - birds - mammals - white tail
perennial fls - blue jay
- Non native - pelicans -
- herons
- osprey

eco. - biot.
- integrity
- ecocentric
- Audubon

corp - gravel ponds

moose

measures IBI
methods

Pollution
enrichment

- Au Sable R.

- corp Jt. Collins

Darwin 1-4

basis

- survival
- adaptiveness

Can't maintain
with biodiversity

Evol. Ecol.

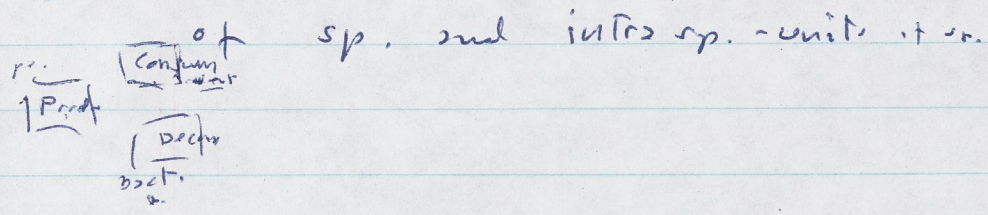
- Titles in latest issue E.R.
by category

Familiar w/ text - Term Pop
Glossary - topics for term pop.

Biodiversity / Biol. Div. - Basis of C.B.

Chapt. 1 - Variety Living Organ. • genetics - population - communities (dominant/keystone)

Chapt. 4 - sp. - how structured - intersp. - Guilds (Trophic groupings)
T=VH
p. 50
- A region, ecosystem (Greater Yellowstone Ecol list of sp.)
C.B. - Preserve biodiversity - prevent extinction



Chapt. 3 Species - sp. problems - different definitions - philosophy

Polish bear
Real wolf.
hybrids
on what is sp., how defined, ~ Real? - some better.

Linn. - 1758 very real - evol. - Darwin - Ark authority

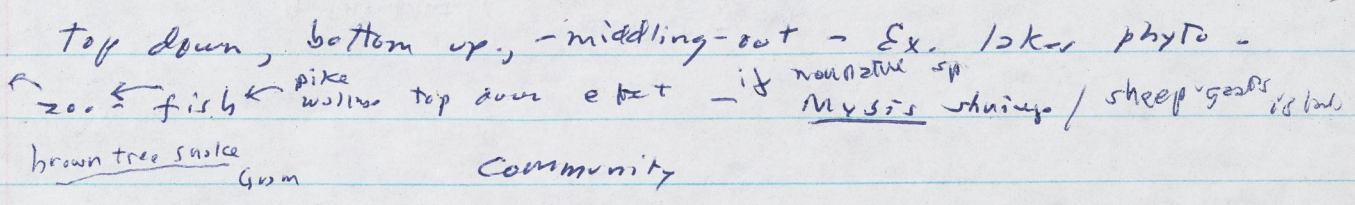
Thus E.S.A. ... sp. "subsp. Distinct Pop. Segment"

gen. quant.
Linn. creativity
good sp. = E.S.U. - but how defined? - A7S book (curious)

Chapt. 11 "Flagship" (Key Sp. msp - birds, mammals - spider - cockroach - (Public perception - public support - people love

E.S.A. & 1994 election - Thus - old growth forest where spotted owl (subsp. - south) - ~~old~~ 17 sp. amphib. - invent. - save signif. part old growth ecosystem w/ spotted owl.

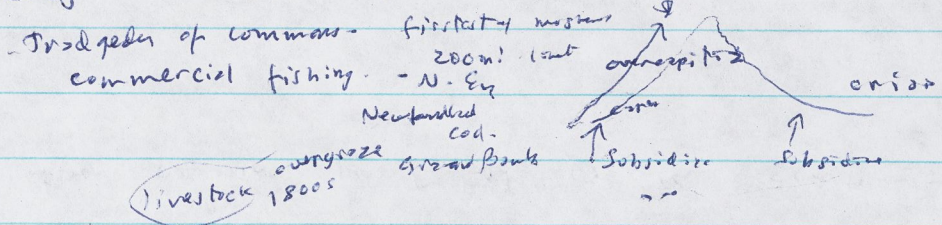
Chapt. 5 Keystone Sp. Robt. Payne - intertidal - oyster - mussels - starfish



sub-discip. →

E.G., L.E., Rest. Ecol.

Anthropocene (short term - 2a)
→ Self-interest (group-specific interest)



Handwritten notes in red ink, partially obscured and difficult to read.

Handwritten notes in red ink, partially obscured and difficult to read.

Chapt. 6 Subdiscipline Conservat. Genetics. Seminar / Book

- What went wrong - danger of illusion techniques
- molecular genetics - quantitative phenotypes - electroph. - mt. DNA - DNA fingerprints (fabulous - i.e. - - -)
 - some molecules or organisms - assumption H. Polymers direct rel. to survival - ^{well-being} abundance (inbreeding depression) -
 - 2 aspects < 1% structural - genes - proteins, enzymes mt. - Selection? - Nothing to do w/ life hist. - ecoli, behaviour - niche - (quant. heritability - fitness, kokanee, sockeye resident - bred. - ~~if~~)

Subdiscipline

Wed.

> Landscape Ecol. - Announcement F.W. Dept. Dr. Short - Not in text. Chapt. 10 ⁹ ~~10~~ ^{Hub, MgP.} Scale - everything connected to everything else. Reserve design - Metapop. - connectedness, corridors - fragmentation - own Soc. - journal -

94 elec. guide to "talking" 1 Fed. by-hatch regulator.

Chapt. 11

Ecosyst. Mgt. ^{Hub, MgP.} - ~~not in text~~ but chapt. 11 - (p. 313 "critical ecol. processes must be maintained") Political - Babbitt - Avoid Environ. Train wreck (CSU - Dim. ^{function} ~~function~~ - E.M.!) - System of buzz words

E.M. = Ecol. Integrity maintain, balanced healthy ecov. - by

C.W.A. Political goal.

maintain ^{natural} structure, functioning, processes ^{- sunlight ->}

Allow NBS FWS - USGS budget

Natural sp. = Sustainability of goods, services, commodities, amenities - Gifford Pinchot -

E.M. Fish Hatch - 80% Fish Resources Budget - FWS Found. Nelly Acetic - S&I

greater good, - - - Natural structures [>] Natural sp. - nonnative. (W.D.)

brown tree snake - no for post - rabbits,

nonnative can disrupt - Mysis ^{detrivore} ^{zoochore} ^{consumer} change energy flow (Eagles) Fishhead L. - But: Colo.: 99% spent for nonnative

← Aquatic v. Terrestrial dams, river reg. - Green R. - F.G. fisher plants Ozark, - N.Z. - S. Am.

Chapt. 1

Disturbance
Calo. R.
L. Powell
Greenhouse

basic
Equilib. - Non-dynamic Equilib. : Re. Equilib. - natality = mortality - pop. stable... by cycles well known - climatic -

sunspots - long term - short term - glaciation, volcanic -

5-10 yrs. - Predictions - ecol. models - uncertainty :
(Ludwig, et al. - Sci.) - Fisheries - Inst. Flows...

news from
stochastic
deterministic

Random - uncertain, unknown = unpredictable (Chaos theory)

Patterns of regularity - balance of nature
w. one sp. = all sp.

sunrise - sunset / tides - solar system - gravity

weather - yr. advance - 100 yr. data - daily, week, month

\bar{x} hi - low \bar{x} precip. \pm confidence interval - very broad -

- satellite - etc. - tomorrow - better than next wk. - next yr. -

- Adaptive Mgt. - Danger - Ill. Technique -

substitute - data for knowledge (P, J.), overwhelmed

by sophistication modern technol. - naive view

"Science" sci. method - Sound sci. ^{Decisions} \rightarrow Sci.

doesn't prove - 'tests' - accept/reject - but

95% 5% wrong ^{develop} Testable hypoth. - null hypote

type 1, Type 2 errors - control - test replicates

* C, B. - Scale - Urgency Politics - Eliza R.

take down dams? N.P. - h. Mich. ^{pred. prog} - stock to mgt

Role of knowledge, expertise, experience - P, J. (Sci.)

Adapt. try - monitor - modify -

Chapt. 2

Ecocentric, Biocentric, Anthropocentric Re.

human values - what we value - Perception value of Nature:

Eco: (Ecofreak) - ^{Tree huggers} Intrinsic values of all life-forms

spart from humans (do trees have standing?) Admer Politen

(but only human advocacy) - w. Utilitarian - Instrumental, Commodity values

Yellowstone Falls
what good is it?

← Type A Type B Biol. -- food or communication

GAIA - Earth as super organism - ^{sp. - tend to -} ^{cells} tissue, organ

not
times all functions, -- sp. as organism - Equilib. theory
balance of nature - but wildlife biol - cycles --

- USFS hunt pred. N.M. - wolf - Think like
mountain + warden killing - bad! - but he was wild hunter

- A.L. wilderness Gilz N.Z. N.M. - Cotton Co. -
hotbed wise-use - Livestock base (1920, ~~to~~ 75 yrs later)

Arthur - see

Yellowstone - wolf reintroductions

"balance of nature" ?

2nd
CE B.A.
BPA
etc

fed. agencies
- NPS - ~~excuse~~ - but constraints - Fishing Bridge complex
- visitors - snowmobiles
CO₂

YNP 2000 mi²
- 15,000
Greater Y. Ecol. Syst. - John Mumma
- private

1991 - Bash Summit

- see photo N-17 | Tongue Point - river channel maintenance

eco/vi. biocentric

controversy - bison - outside YNP - control by state

West. States Coalition

Repub. Congressmen - tour of West - guard environmentalist grossly exposed

Gingrich - YNP bison - feed em' / elk - 5000 1966 elk refuge - feed lot

Ecol. Integrity - Natural Mgt. - Natural mgt. let nature take its course - T.V. - 4,500 elk
- 1960s - 5000 elk

- poison knock trout -

"ideology"

- 1980s - 20,000

→ success/failure? - ^{2 or} willow/overgraze - beaver

willow enclosure - willow / overgrazed
1950s

aspens

poaching
- feed control
- wolves
- min. limit

cow
birds

- Changing Times - more ^{in step} Thoreau & Muir - understand, appreciate nature
- Education CSU .50 anniversary - Dept. Coop. unit. -
- Ecol. Zoog. - map distrib. ^{ecol. g.} few game sp. hook and bullet
- Forestry, Range ^{primary purpose} Bd. ft. timber / GNP: AUM, red west.
- Fed. agencies ^{CE B.R} BLM, ^{agustin} USFS, ¹⁸⁷³ FWS, TVA, BAA NPS ^{difficult} ^{emphatic} ^{eco. vs. anthro}
- Present students: Wm. Jackson - Rec. Res. - ^{Fish. Rec. - Wagon} Wildf.
- then watershed/rec. ... 1st year letter to Dep. Post / greenback
- restoration - Pennock Ck. - ^{survival of fittest} wimpy fish - brown trout

changes in my lifetime - World 3x or 2x - more environ. awareness

- 1957 U (Berke. - Trout Gnt. Basin - AFS Las Vegas - phone booth
- BLM (red west) - ^{whitened out} ^{Gnt. Basin} ^{inst. basin} ^{prescription} ^{but} ^{AD} Helen Chenoweth ^{black} ^{helicopt}
- 1910 Gifford Pinchot - ^{unrepl. - understand present} ^{historical perspective} ^{terms of part.}

Fri: no class Mon. next wed. / Fri: ^(individ. ^{turn} ^{turn})

Coop
Bev
ticket?

~~Wed~~ Mon. Sept. 15

2 wks. (Sept. 2) - turn in 1st Takekew (Term pap. * Cornell
 - news items: Vanessa / Mex. - CSU project) - ^{pop. pressure} ^{responsibility} ^{10,000 bp - N. Am.} ^{most large mammals} ^{2nd - co. 1000 bp, 1000} ^{12000 bp}

Private property
 Amy - non govt - agencies / - Gould ^{5000/2000}
 Ryan - journalism - fine style ^{life history} ^{stealthed / ESA} ^{quadr. / reser. - impermeable geoch}

- S.D. / brown trout ... Bio Science USA Today
 Review: Conceptual, creative thinking / - basis ¹ ² ³ ⁴ ⁵ ⁶ ⁷ ⁸ ⁹ ¹⁰ ¹¹ ¹² ¹³ ¹⁴ ¹⁵ ¹⁶ ¹⁷ ¹⁸ ¹⁹ ²⁰ ²¹ ²² ²³ ²⁴ ²⁵ ²⁶ ²⁷ ²⁸ ²⁹ ³⁰ ³¹ ³² ³³ ³⁴ ³⁵ ³⁶ ³⁷ ³⁸ ³⁹ ⁴⁰ ⁴¹ ⁴² ⁴³ ⁴⁴ ⁴⁵ ⁴⁶ ⁴⁷ ⁴⁸ ⁴⁹ ⁵⁰ ⁵¹ ⁵² ⁵³ ⁵⁴ ⁵⁵ ⁵⁶ ⁵⁷ ⁵⁸ ⁵⁹ ⁶⁰ ⁶¹ ⁶² ⁶³ ⁶⁴ ⁶⁵ ⁶⁶ ⁶⁷ ⁶⁸ ⁶⁹ ⁷⁰ ⁷¹ ⁷² ⁷³ ⁷⁴ ⁷⁵ ⁷⁶ ⁷⁷ ⁷⁸ ⁷⁹ ⁸⁰ ⁸¹ ⁸² ⁸³ ⁸⁴ ⁸⁵ ⁸⁶ ⁸⁷ ⁸⁸ ⁸⁹ ⁹⁰ ⁹¹ ⁹² ⁹³ ⁹⁴ ⁹⁵ ⁹⁶ ⁹⁷ ⁹⁸ ⁹⁹ ¹⁰⁰

ESU - handouts note re. ^{evol. / phylogend} ^{ecological} ^{adaptive range}

Why so much at cabinet range of subject matter
Why so pop
- Problem
- proposed
How recent C.B. recent

1- C.B. at

Forbush's lawsuit / Small court

2 What good is it?

How humans ^{perceive} ⁱⁿ ^{the} ^{world} - non

Wed. patterns / processes - prim. - names for plants/animals

"classification" sys. - how important? - solution non / special - ^{specialist -} ^{maintain}

- Patterns recognized - 'organized' - Aristotle - ^{idea} "essence"

- whole mammals "genus" -

10th ed.

- Formal arrangement Linnaeus 1758 system of Nature

binomial nomenclature - hierarchical - sp., genus, family, order, class, etc

- Processes - Divine creation - God Special creation - immutable + ^{values} ^{conserved}

Bible
→ Genesis

Noah's Ark - all God's creatures - Saudi Arabia fish etc.

but ^{dominate} Dominion over: Control, manipulate - "conquer" wilderness
in wilderness solution of mankind

- mid 18th Thoreau - dif. drummer

Processes 1858 - Evol. Nat. Select - but 1800 Cuvier / Lamarck

^{fossils} - ^{multiple events} catastrophe / gradual change use - disease / inheritance eye, hand

immutable
? domestic
plant
ocean voyager
diversity
not uniform

1800 Lamarck - Cuvier

Cholera
Darwin / Wallace ^{foreign lands} ^{Voyage} Aust. explorer
why preserve
sacredness
diverse pieces

N.R. Public Policy

Acts of Congress

land timber... USFS... CE - Navigation... BLM... USFS... BPA - TVA... SCS... Power plants... fish or dams - if feasible

Fish & Wildlife

Coord. Act. 1934

1960 - Multiple Use Sustained Yield Act

1974 Forest and Rangeland Renewable Resources Act

1976 - National Forest Mgt. Act

1976 - Fed. Land Policy Act

1973 E.S.A

1970 - Nat. Env. Pol. Act NEPA - E.A. - consult w/ E.A.

(feds agencies consult w/ state gov (2nd) and public input, the fed. actions adversely affecting environment)

- But built-in contradictions (conflicts)

emphasizing goals - 1. Use, development, extraction of N.R.

2. Protecting, conserving resources - for sustained use

3. Maintain environ. quality

Positive - valued... Impres Am... And. run of cut... steelhead... mostly...

was my mind

ESA - historic steelhead, coho, OR, WA, WA - Timber End, all... For watershed... - recall 40 yrs - 2 rivers - historical exp. - how much prof. worth?

now not ways to mitigation, restoration, enhancement - don't work? - matter of scale - habitat improve

Perils of Andromy

Lessons from m. history zw/ And - Govt. Lts - great salmon hook - Dams! - focus on water - Watershed health

Lesson from history

Col. R. coho mid Cal. E. Carca chum salmon

borging

Ayerst

long-short term trend zw/ marine conditions coincide

megahistorical 1000s years

if take down dams - next to... no. east 19th cent. growth... but

zw/ Marine conditions - coho/chum - hatch. - much harvested, but

land use - Watershed Per Transition - book

rehab. mitigation - inductive reasoning danger - if... out

New students -

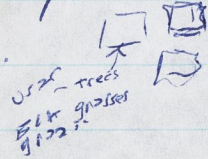
Mon. Sept. 14: ^{Today} turn in answer to one quest. -
- turn in outline for term paper

14-16-18

- Class Friday: catch up. (1 behind) - - -
- Questions? - - - -
- News items? - Contemporary issue - (3 wks.) - COPRIS - ^NPodne
Rio Simpson
- C.B. bull. bd. - speakers - Seminars - Z.O. ^{2nd} -
- Don Leucke - 2nd Ann
- CNHP (Nat. Conserv.) - Volunteers - V.C. Lane Center - * E.S.A. -
- Bering Land Bridge - Biodiversity - some sp. salmon - R.V. -
- bear. Kodiak - S. ^{2nd} Seagle - Bald eagle
- Kamchatka - Russia chaotic - visas - Analyz. ^{2nd} hostages - rubble - ^{corvid} ^{salmon}
- but pristine wilderness - why? one city ^{500 mi. up road} - view nature - Nat. I
- Q. 2, 3. Ecocentric vs. Utilitarian (Anthropocentric).
^{subject} humans - conquer, dominate, control, manipulate
- Biogeogr. - AK Bering Land Bridge ^{siber.} - brown bear - ^{2 factors} - historical - ecological
- sea eagle / bald eagle - ^{of diversity patterns}
- Coevol. Coevolut. ^{US - USSR} ^{US for mammal} ^{grizzly} ^{unclear extinction}
- Alutian Is. Canada goose - Alutian subsp. - ^{ext} island - nesting fox

Friday:

C.B.



Wed. - recap: - historical background leading to

- wolf - dog - why quantitative genetics not sufficient to prioritize "biodiversity" - ^{signif.} ^{hunting dogs} ^{lab retriever / chihuahua} ^{english bulldog}

all C. types

Scan

Mon. Sept. 21 ¹ Debbie. Keystone sp. - - - Original Def

character

indicator sp. - - - ex p. 145 text. Chapt. 8 -

dominant sp. - disproportionate effects - - - engineering sp. - ^{transfer} - beaver - river valley

trophic organizer - wetlands - but ^{type of keystone sp.} ^{ecological} (RMA in Hadden Valley) - Bennett Ck.

Horseshoe Res p. 237 - habitat modifier - ecol. engineer - beaver

linkages - "focus" of paper - can get out of hand - don't write till Thursday

(Nygus) - draft.

ESA

sp. inter-
junction

¹ Keystone sp. ? - ex. of 'confusion' - also Deby. for term paper
Why bother w/ terms? What purpose - ^{C.B.} "preserve, enhance
biodiversity" - USFS/RLM "Action" - Design refuge - L.E. - Monitor.

Essay 20: 48

Earth First

Eco-centrism Bias - Deep Ecology - liberation of land & non-human
life from ^{human} ownership - E.F. "no compromise in defense of

~~Mother Earth~~

- Mon. Oct. 12 Handout - uncertainty & Resource Exploit.

→ Johnson Cheetahs - C. B. 12(4) Aug. 1998: 889
Genetic vs. Ecol. factors limiting pop

- purging - but resistance to pathogens - -

humans - simple member biotic community -

m-w. - | 7 | as needed
- guest - -
- - -

handouts

Syllabus? - text, schedule. - - Contemporary, current.

- Take home - (Oct) - familiarize w/ text

"implications" -- - take notes - - see 6: - ^{impl:} predictive model

nature - patterns of regularity - balance nature - stable - predictable.
essent.
- All - interrelated

- Landscape Eval. - not in text, but 9/10 - fragmentation

→ Grades - 2-3 take home = 200 - ip 300

= Presentation / 50 ^{seminar} ^{→ attend} participants = 2100

term paper - subject: "q" = 300 (1/2 grade) 400

learn topic
in-depth

participation - class discussion - news items - ^{meets - TV} ^{- journals}

Contemporary issues