Interseeding - Why and How to be Successful
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Why interseed into existing greens or fairways?

- To introduce different species or new and better varieties and genetics into an older stand
- To improve the quality of the existing turf
- To improve the density of the existing turf
- Improve the putting conditions or stand

- Greens were damaged by equipment or poor drainage
- Winter or summer killed existing plants
- Improve the heat, stress and disease tolerance
- No budget to totally renovate and reseed with new and better varieties
Why interseed into existing greens?

Fall and Spring Color & Growth

- Retention of fall color and early spring greenup
- Extends season of use
- Active growth for damage repair - ballmarks
- Helps to prevent Poa annua invasion in ballmarks
- Improved wear and traffic tolerance
Successful Interseeding - Lessons for success

- Seed at best time for germination and growth of desired species (dormant seeding can work)

- Reduce competition between existing grass and new species
  - Scalp or lower height of cut to reduce competition
  - Holes from divots, wear, winter or summer damage
  - Holes created by aerification or spiking (more successful than slit seeding)

- Always have seed of desired species in stand for when holes occur - otherwise only weeds will establish in those holes

- Seed at minimum of 2 times the seeding rate of new stand to achieve change in species or cultivar

- Seed to soil contact is needed but can be achieved by traffic, dragging in or placement

- Always more successful in weakest area of stand where you need more coverage
Successful Interseeding - Lessons for success

• Seed at best time for germination and growth of desired species (dormant seeding can work)

• Species differ in optimal germination temperature and establishment rate

• Germination temperature (Lower requirement first)
  • Annual ryegrass = Intermediate ryegrass = Tetraploid Perennial ryegrass < Red fescue (Chewings, slender creeping) = velvet bentgrass = Poa trivialis < Diploid perennial ryegrass = browntop bentgrass < smooth stalk meadowgrass = hard, sheep fescue < creeping bentgrass < Turf-type tall fescue

• Establishment rate (some require higher N rate)
  • Annual ryegrass = Intermediate ryegrass = Tetraploid Perennial ryegrass > Diploid perennial ryegrass > Turf-type tall fescue > creeping bentgrass > Poa trivialis > Velvet, browntop bentgrass > Red fescue (Chewings, slender creeping) = smooth stalk meadowgrass = hard, sheep fescue
Successful Interseeding - Lessons for success

• STERF Fairway Overseeding trial - Low germination lot of red fescue?

Figure 10. Seed germination of browntop bent ‘Jorvik’, velvet bent ‘Villa’, creeping bent ‘Independence’, red fescue ‘Musica’ and annual meadow-grass (unspecified) at different temperatures.
Germination Temperature – *Poa annua* in MD

Germination starts at 20 degrees C (68 degrees F) and continues down to 10 degrees C.


Most germination occurs in Fall – September 15 in MD.
Germination Temperature – Creeping Bentgrass
MN germination in dishes

*Poa annua* not germinating – High Temp = 20 degrees C (65 degrees F)

*Poa annua* germinating rapidly Medium Temp = 10 degrees C (50 degrees F)
Poa annua ssp. reptans or Poa reptans

The good, the bad and the ugly or Why it is a great greens grass

• Circumpolar native weed found on every continent (annual weed)
• Ranges from true annual to greens-type perennial under close mowing
• High tiller density, excellent putting surface
• Invades other grasses by seed and tillers rapidly
• Do not have to worry about Poa annua invasion

Chile, July 2010 - Poa greens, wintergrass on Kikuya fairways
Poa annua ssp. reptans or Poa reptans

The good, the bad and the ugly
Where is my seeded bluegrass?

• Origin- Cross between Poa infirma X Poa supina (probably in Spain) - chromosomes doubled - allotetraploid
• Primarily self pollinated - hard to get crosses (recurrent selection to improve disease resistance, improved water relations is hard)
• Greens-type phenotype instable - epigenetic influence of mowing
• Select desired plants - Produce seed - Initial appearance more like lawn type

David Huff
Cool-Season Grass - Greens/Fairway Species choice

- Poa annua
  Plugs for greens-type, Two Putt - seed
- Creeping Bentgrass
  Readily available
  New genetics
- Velvet Bentgrass – Not well adapted to high pH greens, salinity
  Highest density
  Wear and shade tolerance
- Red Fescues (Browntop bentgrass) – can add into creeping bent
  Links courses
  New ones good wear tolerance
Current Greens/Fairway Species on Courses

- Poa annua (% Courses in room)
- Creeping Bentgrass / Poa annua
  - % of courses
  - % of each species at different times of year
  - Management strategies to shift percentage
  - Chemical strategies to shift percentage
  - Age of greens
  - Greens sand/ pushup greens
- Colonial (Browntop) bentgrass / Fine fescue
- Fine Fescue (% Poa annua)
Why Greens Fail...

- Shade
- Thatch control
- Soil layering
- Improper aerification
- Excessive irrigation
- Poor drainage
- Scalping
- Verticutting
- Disease damage
- Salt accumulation
- Excessive fines - dust

- Rolling greens (excessive)
- Mechanical damage
- Winter damage
- Too much fertility
- Too little fertility
- Fertility imbalance
- Low mowing (excessive)
- Heat stress (excessive)
- Herbicide, PGR Damage
- Improper construction
Potential Sources *Poa annua*

- Existing plants on course or other places produce seed / stolons
  - Animal excrement (deer, rabbits, mice, birds, etc.)
  - Animal feet – Birds (feathers) in particular
  - Shoes and clothing – seed and plant parts (golfers, spectators)
  - Equipment and vehicles (Grandstands, TV equipment)
  - Water – viable seed survives immersion
- Seed
  - Field background – Fieldman and Certification
  - Weed control in fields – Herbicide resistance
  - Lot sizes
  - Sample sizes
Life History of *Poa annua*

- Annual type
  - Germination primarily in Fall as mean temperature drops below 20 degrees C (68 degrees F), some biotypes earlier?
  - Resumes active growth early in spring
  - Annuals produce seedheads in 44-55 days
  - 100 seedheads / plant, 1000-2250 seeds / plant in season
  - Plants primarily self pollinate, produce viable seed shortly after pollination
  - Seed retains high viability in soil for minimum of 4 years
  - Occur more in higher height turf, open areas, seed fields
Life History of *Poa annua*

*Poa annua* seedheads

- Swollen stem
- Seedhead inside swollen stem
- Viable seed still inside leaves – before seedhead visible
Life History of *Poa annua*

Perennial type (Intermediate types occur)

- Less seedheads per plant, produce seedheads 81-93 days after germination
- Mass of tillers with roots at nodes
- Tillers with nodes can become new plants
- Mowing lower selects for perennial biotypes (epigenetics)
- Found on sand to soil
- Tolerates compacted and waterlogged soils (roots near surface)
- More frequent in well watered sites
- Can go dormant with heat – non-flowering tillers establish new plants
Poa annua ssp. reptans
The good, the bad and the ugly
• Oregon State University
• Three sources - Bos Sod + plugs from two courses – Michrodochium patch differences
**Poa annua ssp. reptans or Poa reptans**

The good, the bad and the ugly

Problems with Poa greens

- Major diseases - **anthracnose**, brown patch, summer patch, dollar spot, Pythium blight, *Michrodochium* (Fusarium) patch (pink snow mold)
- Other diseases - Copper spot, **gray snow mold**, red thread, yellow patch, yellow spot, yellow tuft, Waitea patch (brown ring patch), Rapid blight, bacterial wilt
  - In US Mid-Atlantic - Agnew, 2007 - 16 fungicides for Poa annua greens - Primarily top five diseases above

- Insects - Annual bluegrass weevil - increasing problem
- Nematode - *Anguina pacifica* - California coast, England
Poa annua and Creeping Bentgrass Competition on Greens

Why did Poa win so often?

• Seed bank - can produce seed at lowest cutting height
• No bentgrass seed for repair of holes - ballmarks and wear open canopy for seed germination
• Poa annua tolerates low oxygen in root zone better- (thatch, organic matter, overwatering)
• Poa annua concentrates roots in top 1 to 2 inches
• Poa annua could adapt to lower mowing heights than early bentgrass cultivars (Dr. Skogley said no one should cut Providence below 1/4 in)
• Poa annua tillers more rapidly from seed than older bent cultivars
• Poa annua grows under lower soil temperatures than older bent cultivars and better under low light
Creeping Bentgrass Fighting Back
Improvements in newest creeping bentgrass cultivars (not all cultivars have all improvements)

• Significant improvements in dollar spot resistance
• Higher density - more tillers and more rapid tillering
• Improved growth with low nitrogen
• Improved cool temperature growth - (better spring and fall growth)
• Better heat tolerance
• Better root growth
• Higher quality with less superintendent worry - less winter kill, less summer problems

Poa annua and Creeping Bentgrass Competition
Creeping bentgrass vs. annual meadowgrass quality

• Creeping bentgrass has lower rates of Michrodochium patch than annual meadowgrass
• Fertility, rolling, genetics can be used to help control

Bentgrass Conversion

- Multiple seedings needed during summer
- Multiple years of interseeding for best results
- Increased interseedings show results in 1–2 years
- Fewer interseedings, results show in 3-5 years
- Minimum of 10 grams / sq. m (1 kg/100 sq. meters) per year
- Seeding in late spring through late summer more competitive with warm soil temperatures
- Do not seed when night low soil temperatures remain over 82°F (27°C) – too hot
- Dormant seedings useful in some locations
  - Build seed bank with dormant bentgrass
  - Seed to sprout and repair later damage
Creeping Bentgrass Fighting Back

- MacKenzie seeded into Poa annua greens starting in 2007
- Pinetop Country Club
- Picture in 2009
- 70 to 80% bentgrass

Poa annua and Creeping Bentgrass Competition
• 2000 overseeding dates: July 1, August 18, Sept. 18
• Varieties L-93, Penn A-4, Penncross creeping bentgrass and Avalon (SR 7200) velvet bentgrass
• Prior to overseeding all plots were:
  • aerated with 0.375 in. hollow tines at a 1.5 in depth
  • topdressed with medium grade sand
  • verticut at a depth of 0.375 in
• Seeding rate – 73 kg/ha (65 lbs / A)
  • 5-5-0 fertilizer was used as a carrier
• Seed was applied by hand and brushed in with a broom
• July 1 and August 18 more bentgrass established
JAPAN-Extreme Interseeding

- Spike & seed starting in early summer
- 10-15 gr / sq. meter total / summer
- Apply the seed to the surface, topdress & use a drag mat to settle seed into the openings
- For best results, repeat every 7-10 days during the summer months - up to 6 to 8 times during the summer for fastest results
- Small amount of total seed applied
- Ex: 2 gr / sq. m X 6 applications
- 700 sq. meter green = 8.4 kg / summer (REPEAT for 5 Years)
SPIKER SEEDER
Spiker Seeder
- new seedlings after 2 weeks
Bentgrass Conversion – From *Poa annua*

Oconomowoc Golf Club, WI - New cultivar interseeding
Bentgrass Conversion

Oconomowoc Golf Club, WI - 007 Interseeding
Tees, Fairways, Roughs

Species Selection

Turf characteristics for Tee, Fairway and Rough Turf

- Drought, Heat & Salt tolerant
- Wear tolerant
- Fast establishment
- Rapid recovery (wear and divots)
- Disease & Pest tolerant
Seeding Rates

- Always harder to establish into existing stand so use 2 to 4 times normal seeding rates (normal seeding rates less than 2 seeds/sq. cm)
- Smaller seeds = more competition – Cover still faster with larger seeds
  - Southeastern overseeding –
    - Greens - Perennial rye 7.75 seeds/sq. cm, Poa triv 15.5 seeds / sq. cm, creeping bentgrass 23.2 seed / sq. cm
    - Fairways – Perennial rye 2.3 seeds/sq. cm, Poa triv 6.6 seeds / sq. cm, creeping bentgrass 7.0 seed / sq. cm
  - Southwestern overseeding
    - Greens – Perennial rye 16 seed/sq. cm, Poa triv 66 seeds/sq. cm,, Fine fescue 29 seeds/ sq. cm., velvet bentgrass 155 seeds/sq. in (in play 2 weeks)
Seeding Rates

- Sports Fields keep cover during wear by heavy rates of seed in wear areas
  - Germination and establishment PR with wear faster than tall fescue which is faster than smooth-stalked meadowgrass (*Poa pratensis*)
- Still optimal if you can seed during time of fastest germination and establishment of target species
- Make sure you add in fertilization during interseeding (preferred 50 kg N/ha)
- Do not have to do whole field or golf course.
  - Choose weak areas first – more successful and bigger impact
- Most cultivars selected based on data from mature plants
  - Cultivars in all species vary on speed of establishment and establishment under low maintenance
Techniques to Maintain Cover in Natural Field

- Unirrigated site Spring seeding
- Multiple depth seeding at deeper seeding depth for summer survival
- Higher seeding rate
- New seedlings that emerge have deeper root system
- Better able to survive (Grande and Shortell, GCM 08/15:84-88)
Techniques to Maintain Cover in Natural Field

Greenhouse seeding depth

![Graph showing seeding depth (inches) for different grasses: Perennial ryegrass, Tall fescue, Kentucky bluegrass. Different depths are represented by bars with letters indicating statistical significance.]

% ground cover rototilling

![Graph showing % ground cover after 36 days for different grasses: Perennial ryegrass, Tall fescue, Kentucky bluegrass. Different rototilling depths are represented by bars with letters indicating statistical significance.]

Figure 1. At 21 days after seeding, with favorable soil moisture and temperatures under greenhouse conditions, 16% of the Kentucky bluegrass, 26% of the tall fescue and 44% of the perennial ryegrass emerged from the deepest planting depths for each species (1.25 inches for Kentucky bluegrass and 1.75 inches for tall fescue and perennial ryegrass). Because of its smaller seed size, Kentucky bluegrass was seeded at shallower depths. Means within the same species and marked with the same letter are not statistically different.

Figure 2. At 36 days after planting, groundcover for the larger-seeded species ranged from a minimum of 55% for tall fescue (5-inch rototilling) to 93% for perennial ryegrass (2.5-inch rototilling). The 0-0.3-inch-deep seeding with a traditional cultipacker produced 80% groundcover for both perennial ryegrass and tall fescue. Means within the same species and marked with the same letter are not statistically different.
Lessons learned from STERF Interseeding Trials

Slit seeder and Aerification Holes, May 1 and Sept 1, + or - Fertility

• More success with aerification holes and topdressing than slit seeder (correlates more to deeper planting and less competition)
• Greater success with Perennial ryegrass then Red fescue (Chewings and slender creeping red) then smooth-stalked meadowgrass (*Poa pratensis*)
• September slightly better than May but soil temp only 7-8 degrees C
• Fertility helps establishment, and maintenance of current stand
• Traffic influence seedling survival – why higher seed rates are needed
• Seed banks are desirable without them the only thing that can germinate in holes are weeds
• Cost – Improve your worst spots first
September seeding – Glyphosate or Glyphosate + Dazomet

- Seedbed Prep - Verticut and Core better than no prep
- Vericut more annual bluegrass contamination
- Core cultivation less ABG contamination
- Slit seeder worked on all prep while drop and spike seeders worked best with verticutting and core cultivation
- ABG contamination equivalent next year all prep
- Cultivar, waiting until September may have influenced
Seed Quality and Treatments

Do not plant your problems

• Goal - reduce *Poa annua* and other weeds
• Certification allows certain levels of weed and other crop seed in seed
• Ask for seed without weed and other crop seed
• Seed that has had additional testing and is clean is more of a guarantee
• Seed treatments that include nitrogen and other products next to the seed can improve chances of establishment